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Propelling Ships, Propellors, Paddle-wheels, and Screws.—W. G. Wrench, 831. W. Cloete and W. P. Churchward, 858. R. H. Armit, 1018.

Pulleys.—T. H. King, 749. T. Dutson, 875.

Pumps, Pumping and Raising Water and other Liquids, Pumps, Pistons, and Packing.—J. Fielding, 736. H. B. Vercoe, 773. C. Burnett and C. D. Austin, 879. R. Bredo, 880. J. Cougnet and A. P. Potel, 1109.

Punching and Perforating.—R. H. Tweddell, J. Platt, and J. Fielding, 797. G. Miller, 954. J. C. Scott, 1038. T. Walmsley and J. Thompson, 1061.

Railways, Permanent Way, Rail Joints, Chairs and Sleepers, Portable Railways, Atmospheric Railways, Switches, points, Crossings, and Turntables.—G. W. Dyson, 794. H. S. Bucknell, 866. F. C. Payne (com.), 910. A. Oppenheimer, 967. G. Thornley and T. Buxton, 984. J. S. Williams, 995. J. Scott, 1038. W. R. Lake (com.), 1072.

Railways, Carriages, Coupling, Uncoupling, and Altering Position of Carriages and Engines.—J. Dence, 750. J. Fenwick, 774. W. R. Lake (com.), 842. A. Oppenheimer, 967. F. H. F. Engel (com.), 1069. G. Parfitt, 1093. L. Sterne (com.), 1107.

Reaping, Mowing, Making Hay, Gathering in Produce.—S. Pitt (com.), 776. W. R. Lake (com.), 888. C. T. Burgess, 978. J. Bramall, 1027. M. T. Neale, 1116.

Reflectors; Reflection of Light.—M. T. Neale, 902.

Refrigerating, Cooling Liquids, Making Ice.—B. A. Johnson and C. A. Fisher, 808. W. Young, 937. W. R. Lake (com.), 1095. C. Pieper (com.), 1099.

Registering, Indicating, and marking.—G. E. Webster, 723. H. Simon (com.), 735. W. R. Lake (com.), 965. E. de Jong, 1076.

Retorts and Crucibles; Melting Pots.—T. H. Bell, W. Harle, and R. Clough, 990. W. R. Lake (com.), 1033.

Sewing and Embroidering.—P. A. Kautz, 775. C. Necker, 936. W. R. Lake (com.), 1007. W. Fairweather, 1058. T. Chadwick and T. Sugden, 1080. W. Heath, 1090.

Shears, Scissors, &c.—S. Wilks, 793.

Ship and Boatbuilding.—W. R. Lake (com.), 747. A. Nicol, 778. E. W. Duppa, 841. W. Cloete and W. P. Churchward, 858. A. F. Yarrow, 872. J. G. Tongue (com.), 895. E. Cutlan, 909. W. R. M'Ateer, 919. T. H. Watson and S. J. Woodhouse, 930. G. J. Rudolf, 1014.

Ships (Raising Sunken or Wrecked).—D. Halpin, 802.

Ships' Rigging and Sails, &c.—T. Byas, 920. E. R. Wethered, 976.

Shot, Shell, Bullets, &c.—A. L. Favolle, 864. C. W. Lancaster (com.), 896. T. H. Watson and S. J. Woodhouse, 930. E. G. M. Donnithorne, 1068.

Shuttles.—J. Greenwood, 854. W. Heath, 1090.

Sign and Name Plates, &c.—T. Ollis, 894. A. J. Thirion and H. A. Le V. de Pontigny, 1059.

Signals, Alarms, Communicating Apparatus, Conveying Sounds.—E. C. Walker, 844. R. G. Coveney, 998. T. R. Kenyon, 1035.

Smoke (Preventing, Burning, and Condensing.—E. Thomas, 769.

Soap.—A. George, 833. J. B. Mackey and J. Sellers, 934. C. B. Cooper and C. W. Smith, 945.

Sounding, Ascertaining Depth of Water.—A. M. Clark (com.), 787.

Spindles.—W. and R. Paulson, 798. T. Unsworth, 873.

Spinning and Preparing for Spinning.—T. Unsworth, 741. T. Coulthard, 742. J. Bullough (com.), 807. J. C. Mewburn (com.), 817. W. Stewart, 827. T. Unsworth, 873. W. Brookes (com.), 905. F. H. Ziffer, 972. W. Dixon, 983. R. Curtis, W. H. Rhodes, and J. Wain, 1034. A. M. Clark (com.), 1056.

Springs.—F. Joynes, 738. W. Buckley, 756.

Stacking Agricultural Produce, &c.—W. Bouttell, 1057.

Steam and other Boilers, Cleaning and Preventing Incrustation of Boilers, Water Feeding Apparatus for Boilers.—J. Furness, 752. E. Crompton and J. T. Cochran, 770. J. Litton and J. Davis, 800. H. H. Henson, 813. W. Bracewell, 847. C. Scriven, 883. J. Harrop and J. Howden, 1013. J. Stephenson, 1016. J. C. Scott, 1038. J. B. Armitage and W. Taylor, 1048. J. A. and J. Hopkinson, 1087.

Steam Engines (Stationary, Locomotive, and Marine.)—J. Parker, 819. C. Burnett and C. D. Austin, 879. W. Allan, 898. D. J. Lewin, 991. E. A. Sacre, 1029. D. J. Morgan, 1031. A. C. Henderson (com.), 1045.

Steering or Guiding Ships, Carriages, Ploughs, &c.—L. de Guenedal, 743. W. R. Lake (com.), 747.

Stone and Slate, Artificial Stone and Marble, Grindstones and Millstones.—W. Halliwell, 940.

Surgery, &c.—R. L. Johnson, 829. J. Hammond, 1082.

Telegraphs; Telegraph Printing Apparatus.—F. Lambert, 759. H. Conradi (com.), 767. C. E. Walker, 844. W. Morgan-Brown (com.), 1079.

Tents, &c.—L. Field, 818. J. Moss, 1028.

Thrashing Machines.—C. M'Fadzeau, 938. W. Bouttell, 1057.

Tobacco and Snuff, Cigars, Cigar-holders, Pipe and Cigar-lighters, Smoking-pipes, Tobacco-pouches.—W. R. Lake (com.), 746. A. Oppenheimer (com.), 848. A. Oppenheimer (com.), 849. W. Rest, 988. E. Wolf, 1002.

Tools, Tool Holders.—R. Clarke, 885.

Torpedoes.—W. R. Lake (com.), 747. T. H. Watson and S. J. Woodhouse, 930.

Tramways and Tramway Carriages, Tramway Locomotives.—G. W. Dyson, 722. N. L. Nathan, 745. J. Dence, 750. D. J. Lewin, 991. E. A. Sacre, 1029.

Trimmings.—W. R. Lake (com.), 876.

Turning, Lathes for Turning.—G. Thornley and T. Buxtou, 984.

Umbrellas, Parasols, &c.—T. Rickett, 803. J. C. Smith and G. G. Lusher, 862. W. R. Lake (com.), 1102.

Upholstery, &c.—J. T. Goudie, 899.

Valves, Taps, Stop Cocks, Plugs; Regulating the Flow and Pressure of Fluids.—R. Powell, 739. D. B. Peebles, 755. J. G. Kingdorn and W. J. Coe, 850. G. Henderson and D. M'Neil, 949. G. W. Garrood, 1000. G. W. von Nawrocki (com.), 1024. Carcline A. Bowen, 1037. W. R. Lake (com.), 1096. J. and J. A. Hopkinson, 1097.

Velocipedes, Bicycles.—T. Bayliss, J. Thomas, J. Slaughter, and J. Elliott, 716. E. de Pass (com.), 764. G. D. Scott and G. H. Phillott, 870. R. J. Rae, 979.

Ventilation; Supplying and Purifying Air for Buidings, Mines, Ships, Carriages, &c.—E. Thomas, 769. J. Corbett, 855. H. B. Fox, 867. W. Symonds, 944. T. Holroyd, 993. R. C. Parsons and E. Palliser, 1015.

Washing, Cleansing, and Wringing Fabrics, Yarns, and Materials.—A. Sauvée (com.), 730. J. and J. Smith, 1083.

Waterclosets, &c.—J. W. Jamieson, 980.

Waterwheels and Engines, &c.—J. Fielding, 736.

Weaving, Braiding, Plaiting, Preparing for Weaving.—W. and E. Fielden, 734. T. Unsworth, 741. J. Pilling and S. Booth, 753. H. and C. E. Williams, 758. J. Greenwood, 854. G. Kirk, 889. M. Pearson, 893. J. Collier, 912. J. A. Porter and R. Thompson, 927. A. C. Henderson (com.), 985. J. Whiteley, 1025. R. Hall and J. Hobson, 1026. J. Almond, 1039. E. G. Brewer (com.), 1050. C. and T. H. Brigg, 1064.

Weighing Machines, Scales, Indicating Weight. W. E. Gedge (com.), 810.

Wheels for Carriages, &c.—T. H. King, 749. J. Dence, 750. G. D. Scott and G. H. Phillott, 860. F. Wirth (com.), 926.

Wheels for Machinery.—A. M. Clark (com.), 1008.

Winding, Reeling, and Balling Yarn and Thread.—T. Unsworth, 741. P. Jensen 1041.

Window Blinds, &c.—T. Dutson, 875. W. R. Lake (com.), 952.

Windows and Sashes, &c.—C. Brothers, 796. Alice J. L. Gordon, 811. A. M. Clark (com.), 824. D. S. Musgrave and T. Humphreys, 868. R. J. Worrall, 870. R. Melville, 871. G. Penny, 928. T. R. Kenyon, 1035. Ellen A. Clapham, 1049.

Wire-Working, Wire Ropes, Telegraph Cables.—F. Lambert, 759. H. Conradi (com.), 767. J. Temple, 851.

Woods and Veneers, Artificial Wood.—A. M. Clark (com.), 843.

⁂ *The above List is prepared from the Patent Records by Mr. T. Morgan, Secretary of the Inventors' Patentright Association, Limited.*

INVENTIVE INGENUITY.

Although some objection might be raised in this country against converting our railroads into bicycle courses, it appears that is America an inventor has been exercising hin ingenuity in this direction. Mr. Johnson, a travelling musician, being in Garland, Colorado, and anxious to depart, manufactured a velocipede, with which he proposed to travel into Texas. Having become possessed of two two-wheeled velocipedes, such as were in common use a few years ago, he proceeded to fasten them together to run on a railroad. Wooden axles were constructed so that the machine could be adapted to any gauge of track, a broader tread was placed on the wheels, to which were added flanges made of whiskey barrel hoops, levers were fitted to give means for using the hands as well as the feet to gain motive power, the whole arrangement was given a coat of red paint, and it was placed on the track of Garland ready for service.

The machine weighs about forty pounds, and is easily handled. The operator sits on a seat resting across what were the two seats of the old velocipedes. Johnson mounted his novel travelling apparatus at Garland, and proceeded without accident, travelling at the rate of about fifteen miles per hour. Altering the gauge of his car to suit that of the Atchison, Topeka, and Santa Fe Railroad, he started out for the East. Our informant tells us that he saw Johnson near Goldsmith's ranch, and tried to keep up with his car on a good horse, but the animal was soon distanced. The engineer of the eastern-bound passenger train met Johnson at Apishapa. Johnson is an old railroad man, and always provides himself with a time-card, so that he can keep out of the way of the regular trains. His apparatus is so light that it can be moved from the rails in a moment.

Reviews.

HALBERT'S ECONOMIC AND FINANCIAL SCIENCE.

"An Exposition of Economic and Financial Science, based on a Cycle of Seasons in each Decade." By WILLIAM MORTON HALBERT. London: Remington and Co., 5, Arundel-street, Strand, W.C. 1878.

IN this work Mr. Morton Halbert seeks to connect the phenomena of the money market—if we may use such a term—with the phenomena of Nature, and so to account for the movements in the financial world by those of the world of nature. Probably the key-note or text of this exposition may be stated to be the following utterance of Alexander von Humboldt, which Mr. Halbert quotes:—"In reflecting," says that eminent *savant*, "upon physical phenomena and events, and tracing their causes by the process of reason, we become more and more convinced of the truth of the ancient doctrine, that the forces inherent in matter and those which govern the moral world exercise their action, under the control of primordial necessity, and in accordance with movements occurring 'periodically' after longer or shorter intervals. It is this primordial necessity, this occult (hidden) but permanent connection, this periodical recurrence in the progressive development of forms, phenomena, and events, which constitute nature, obedient to the first impulse imparted to it."

Upon such a basis as this Mr. Halbert works out his exposition of economics and finance, and we can fairly say that he does so in a way that cannot be better described than as able and interesting. Although this work is not deficient in statistics and tables, they are only occasionally and incidentally introduced, an extensive range being made from economics to sun spots. Thus the first chapter treats of Adam Smith and other economists, and their works. Other chapters have reference to the doctrines on production, exchange, value, and price; the law of periodicity of events in financial affairs; capital currency in banking; mean averages in the money market and in the corn market; bullion and gold coin averages in Bank of England. Subsequent chapters relate to—a cycle of seasons as indicated by the rainfall; vital statistics indicating a cycle of seasons; a review and contrast of contingent versus necessary truth, in which Mr. Halbert, we are glad to find, joins that eminent man, Mr. John Stuart Mill, in characterising the leading propositions of political economy as "truths in the rough," or, as we would say, little more than half-truths. In fact, there is to our mind so much of conjecture about most of the propositions of political economy, that we have never been able to give it a place amongst the sciences properly so-called. Meteorological science, as also its connection with other sciences, are dealt with in the ninth and tenth chapters, which are followed by a chapter on sun spots and their connection with a cycle of seasons. To sum up our review of this work, we can fairly venture to say that much of *science* and careful investigation has been brought to bear upon political economy, and all is presented in an interesting and readable form, the type being of good size, the print clear, and the paper good.

MONTAGUE BROWN'S TAXIDERMY.

"Practical Taxidermy: a Manual of Instruction to the Amateur in Collecting, Preserving, and Setting-up Natural History Specimens of all Kinds." Illustrated. By MONTAGUE BROWNE (A.M.B.). London: *Bazaar* Office, 32, Wellington-street, Strand, W.C.

THIS is a very interesting and practical work on a subject which has a charm for many persons—the collection and conservation of natural history specimens. It is not a mere handbook, but a very complete treatise on the subject of taxidermy; and to show how deeply the author goes into the matter, we may mention that in his first chapter he refers to taxidermy as practised amongst the ancients, therein referring to the processes of embalming the human body adopted by the ancient Egyptians.

Succeeding chapters relate to trapping and decoying birds and animals; necessary tools; preservative soaps, powders, &c.; skinning and preserving birds, animals, and fish; also mounting the latter; dressing and softening skins as leather; also relaxing and cleaning skins.

In the concluding pages the polishing of horns, shells, &c., the colouring of bills and feet of birds, and many other subjects connected with preservation of various natural history specimens, are fully and practically treated. Entomology is not forgotten, much instruction being given as to nets, killing, bottles, boxes, &c.

The whole work being full of practical instruction, and given in a connected form, it would be useless to quote from it, as any extract would necessarily be of greater length than our available space will admit of.

LEE'S TRANSLATION OF KELLER'S LAKE DWELLINGS.

"The Lake Dwellings of Switzerland and Other Parts of Europe." By DR. FERDINAND KELLER, President of the Antiquarian Society of Zurich. Second Edition, greatly enlarged. Translated and arranged by JOHN EDWARD LEE, F.S.A., Author of "Isca Silurium," &c. In Two Volumes. London: Longmans, Green, and Co. 1878.

THIS is a real *magnum opus* on a subject of great interest at the present day. Of the two volumes forming the complete work, it is proper to say that one is filled with plates illustrating various remains of ancient lake dwellings and instruments and utensils used by the lake dwellers.

Although the present is the second edition of this valuable work, we feel sure that many of our readers will be pleased by our treating it more in detail than we usually do in such cases. A work so voluminous and exhaustive as this, leaves the critic little chance of presenting quotations of reasonable length such as shall fairly illustrate its nature and character; therefore we shall content ourselves with some general observations on the work we have gathered up therefrom, that is to say:—

Its object is to lay before English antiquaries a summary of what has hitherto been discovered respecting the lake dwellings of Switzerland, and the neighbouring countries, together with a glance at the corresponding settlements in other parts of Europe.

These facts were originally published in the reports on the subject laid before the Antiquarian Association of Zurich; but as these communications were made at various times just as the discoveries were unfolded in this new field of enquiry, it necessarily follows that the original reports contain a certain amount of repetition; and also that conjectures made at an early period of the investigations were either confirmed or disproved by subsequent discoveries. The present volume, therefore, is not a simple translation of the reports on the lake dwellings printed by the Antiquarian Association, but a condensed account taken from the whole of them: the substance remains, though the mode of stating it is altered. It may, however, be well to mention that in every case when it was possible the original has been very closely adhered to, though not in the order in which it is given; and in most cases the language and expressions are the same, translated into English. In the present edition the whole of Dr. Keller's seventh report, which appeared in the spring of 1876, has been incorporated; besides which notices of several other lake dwellings, both in Switzerland and elsewhere, by various authors, have been added, so as to bring the information, as far as possible, down to the present day.

It is hardly necessary here to state, what in the year 1855 was new to antiquarians, that from a series of discoveries the fact is made manifest, that in the very earliest times groups of families, or probably whole tribes, subsisting by hunting and fishing, with some knowledge of agriculture, lived on the borders of the Swiss lakes, in huts built not on dry ground, but on a series of piles in the shallows near the shores. Since that time it has been ascertained that this peculiar mode of living was not confined to the inhabitants of Switzerland alone, but extended to several of the neighbouring countries—nay, more than this, the information which is rapidly accumulating on all sides will probably bear out the supposition made in the year 1855, that this mode of settlement is to be found in the whole circle of the countries formerly Celtic, the author in his later reports having evidently avoided using any names which might possibly indicate the nationality of the lake-dwellers. At all events, lake dwellings, if not pile dwellings, existed in Ireland and Scotland, and one also in Wales, and these in many respects may be considered analogous to a few of peculiar construction found in Switzerland, although they appear to be very decidedly of much later date. These peculiar lake dwellings are described in their place.

The work embodies full information as to the original discovery of lake dwellings, remarks on the Ages of Stone Bronze and Iron, with descriptive details as to lacustrine remains at various places in Switzerland and elsewhere; as also, for comparison, as to settlements on the mainland at Ebersberg, Vilters, Nethberg, and Windisch.

The investigations of several *savants* who have inquired into this subject, such as Strobel, on the origin of the Terra-mara Beds; Rev. Dr. Oswald Heer, on plants of the lake dwellings; Professor Rütimeyer, their animal remains, &c.; and Professor De Fellenberg's analysis of the bronze implements, are all duly presented to the reader; and the researches on Irish, Scotch, and Welsh Crannoges, by G. H. Kinahan, John Stuart, and Rev. E. N. Dumbleton respectively, are duly noted. In short, the work is a most elaborate treatise on the whole subject and all that pertains to it, in language attractive to the general reader, the present edition making good anything that might possibly be deemed insufficient in the former one.

THE GEOMETRY OF COMPASSES.

"The Geometry of Compasses; or, Problems resolved by the mere Description of Circles, and the Use of Coloured Diagrams and Symbols." By OLIVER BYRNE. Crosby Lockwood & Co.

THIS is a very successful attempt at resolving problems with only one instrumental aid—the compasses. Colours are used in the diagrams with considerable success, to make the constructions speak for themselves without reference to the accompanying descriptions.

THERMODYNAMICS.

"Thermodynamics." By RICHARD WORMELL, D.Sc., M.A. Longmans & Co.

WE have here in small compass a clear and philosophical summary of the theory of heat, including thermometry, calorimetry, expansion, the production of heat by friction, specific heats of gases, air-engines, heat-engines generally; Carnot's conception of a reversible engine; Carnot's function; Thomson's absolute scale of temperature; and the kinetic theory of gases. It will be doubtless found useful in the training of engineering students. There is no empirical formulæ as in many tooks on the steam-engine.

NOTICES AND POSTPONEMENTS.

The Domestic Dictionary, published by Messrs. Cassell; as also *Science for All* and the *Practical Dictionary of Mechanics*, serials issued by the same publishers, which we alluded to last month, are progressing in as satisfactory a manner as other works issued by the same firm always have done.

We are compelled to postpone poetry by our well-known correspondent, Henry George Hellon. Also several Reviews, amongst others, Everett's "Elementary Physics."

The Scribbler, a journal published at Newcastle-on-Tyne, and devoted to the productions of amateurs, deserves our favourable notice; but this we must reserve for a future opportunity.

INDUSTRY AND ART IN LONDON.

(By a Correspondent.)

Iron Roofing and Houses.—Messrs. A. and J. Main, of Queen Victoria-street, have devoted a good deal of attention to the construction of iron roofs, houses, &c. We may mention their strong galvanised corrugated iron roofing, applied to cattle-feeding house or enclosures of wide spans. The design of this roofing is to cover in one span a width from thirty to forty feet. In an illustration of this we have seen, the roof is applied to a house or byre for two rows of animals, with a wide passage up the centre for feeding, and one along each side for cleansing. The walls can be formed of galvanised corrugated sheet iron or light brick work built between the iron columns. The roof is ridge-shaped, covered with galvanised iron aforesaid, with strong iron couples spanning the whole building, fitted with tie-bars and struts attached to the iron columns in the walls. Provision is made for a range of glass three feet deep upon one side of the roof, and ventilators are along the top. These houses are designed for the agricultural houses which our advanced and experimental system of farming and mansion appurtenances affects. This roofing is also designed for colliery coverings, drill halls, coffee plantations, stores, and every kind of iron structure. Some stress is laid on their tenant farmers' shed for cattle or sheep, it being alleged by the firm that it is the simplest and cheapest which can be made. It is made thirty to sixty feet long by twenty. As the roof is circular, only sheeting and tie-bars are required. The side and end walls are wood, and can be supplied by a local joiner. We admire most the galvanised iron ridge roof, which has been supplied at Ceylon a good deal, and would be very suitable for purposes such as wholesale markets in this country. It is elegant, with a centre compartment and two wings. It can have open sides, or light brickwork walls, and it is also liked in Ceylon as a cattle-house. Readers who own estates or farmers will appreciate the above particulars.

Patent Piston Springs.—These are quite newly brought out, and the advantages proposed are, first cost, economy, a minimum of friction when working, applicability to existing pistons, can be fitted in one day; adjustment by rule deduced from success in working a large number of pistons already fitted; no tendency to breaking or slacking of springs, which are quite independent of the piston. These articles are already coming a good deal into use; a number of steamers have been supplied, and the P. and O. Company are adopting them to some extent. Various sizes are kept, and when an order is given depth and thickness of packing, ring, diameter of cylinder and space between ring and piston should be stated. Some of the instructions for use set forth that the springs should be turned up, so that the ends just meet inside the packing rings; then put liners in between ends of spring, equal to one-tenth of an inch, &c. The thickness of liner is always the diameter of inside packing ring with a decimal point before it; thus, inside of packing ring 75 inches, liner should be three-fourths of an inch. The inside must be at least a quarter of an inch clear of body of piston and liners. Pistons up to fifty inches diameter can be fitted with a spring all in one piece, in which case about fifteen to eighteen inches from each end must be added to the exact diameter inside of packing ring. A careful smith can unite the ends without letting down the temper. The patent is Mr. Anderson's, London-street, E.C., agent for Messrs. Marshall and Wylie.

Musical Publications.—Messrs. Swan and Pentland, Great Marlborough-street, have brought out some new pieces deserving mention. Amongst them "The Golden Cross" and "Shine On," a song *a la* Gounod, is within the range of persons even who have no great knowledge of music but gifted with voice. It is well there should be some music of this character. On the other hand, for persons who know good music their fantasie on Scotch airs is in a field of which they are amongst the chief owners, and ought to have the attention of those who like this kind of thing good. Messrs. Francis Bros. and Day, of 351, Oxford-street, just now offer seven new pieces to the musical public. "Still I Love Thee," by Leon Doré, for the pianoforte, from the Mohawk Minstrels' songs, is an adaptation of value. "Bonnie Wreath Polka," by W. Smallwood, has such a well-painted wreath on the title-page as to make it almost—irrespective of musical merits—worth obtaining for all drawing-room collections. The polka seems to be rapidly coming into favour again. At any rate, as a pianoforte piece this one is fashionable. We were taken with a song, "Happy Memories," written by J. Langbridge. Each stanza ends thus:—

"Ah, scenes of my childhood's bright remembrance,
Blooming in summer's changeless smile,
Clothed with the dreamy haze of distance,
Ye smile with a changeless smile."

There is a good deal of poetry on analysis to be found in this song, and we prefer it to all the other pieces. The music is, like that of the others, tolerably easy; and for the purpose of making up a portfolio of good music, we recommend some of Messrs. Francis and Day's collection as a *sine quâ non*. It has also a valentine title-page. Next, then, "Standard a Thousand Years Old," with large coloured representation of the national flag of England, must be mentioned. The words are by Charles Townley. As in the case of many national songs, they are more remarkable for sentiment than poetic excellence, but the music is spirited. Another song, "The Boatman's Daughter," by Dr. Cleasby, is of some excellence.

Dramatic Art.—We have but little space left for noticing what is going on in this branch of Art; in fact, in these days the great point seems to be to get hold of a piece that, from its adaptability to the powers of our artistes, shall have a run, and to run it on; so that there is little demanding notice. At the Lyceum, "Louis XI." has been revived, and it is not too much to say that Mr. Henry Irving, by his performance of the part of the King, adds another to his already well-earned laurels. He is ably supported by Messrs. Mead, Lyons, Tyars, Bentley, Fernandez, and other actors, and by Mrs. Chippendale and Miss Virginia Francis.

The Autotype Company are, we hear, doing something very novel in colouring We shall, perhaps, refer to this matter again.

FOREIGN SCIENCE.

A Parisian advocate of Court of Appeal, Saigné, has just brought out a very useful work in reference to the Exhibition, being the law of patents of all nations, and the bearings of laws in every form upon the matters exhibited, with an appendix containing all instructions and particulars of the Exhibition.

M. Guizot writes to *Les Mondes* that, thanks to M. Trouvé, they have been trying Professor Bell's telephone. They surprised M. Trouvé in other work, and less than five minutes sufficed to put the apparatus, which was entirely dismounted, in working order. The results, too, were extraordinarily precise. They succeeded in carrying on a conversation with several persons present, and everyone was astonished at the exactness of pitch of the sounds of the voice of the different experimentalists. They heard at a resistance of 3,000 kilometres the bell of a repetition watch, which M. Trouvé had placed at the embouchure of the transmitter.

We fear that even the best of men sometimes talk nonsense. A M. Virchow, who is presented as a *savant*, in the course of a grand speech, coolly says, "We cannot teach, we cannot consider as an accomplished fact in science, that man descends from the ape or any other animal. We can only place the proposition in the state of a problematical proposition, although it may offer a certain probability."

The Society of Biology, founded by M. Claude Bernard, has taken the initiative in raising a subscription for a monument, and they hope the other societies of which he was a member—Superior Council of Public Instruction, Academy of Sciences, French Academy, College de France, Museum of Faculty of Sciences, Faculty of Medicine, and Academy of Medicine—will join.

Physical astronomy is engaging a good deal of attention; this being the name given to investigations of the theory that some of the mineralogical productions of our earth are in the sun and other bodies above us.

MM. Siespel and Maes have died at Bergamoyo, Zanzibar mission. These two travellers made a part of the Belgian expedition sent to traverse Africa. This expedition was composed of four members. The survivors are MM. Gambich and Marnot.

Information as to Edison's phonograph, recently tried before the Academy of Sciences, is thus given;—In fine, it spoke before the learned Assembly—we have seen and heard it. Impossible it is to express here the enthusiasm which was depicted upon every countenance. The voice is clear, neat, mathematically faithful. The operator confided to it the following words: "M. Phonograph, do you speak French ?," And the phonograph repeated them neatly. It will repeat them as many times as wished. What can be more marvellous!

Les Mondes is still, it is alleged, the only paper in France which gave the description of this instrument.

Salts of potassium ordinarily employed in industry are carbonate, chloride, prussiate, chromate, nitrate, silicate, and sulphate, to which we must add, for the products in use in pharmacy or photography, chloride, bromide, and iodide of potassium. These diverse salts of potassium serve for the fabrication of soap, glass, saltpetre, alum, and colours. They are also employed in printed goods, washing, bleaching, &c. The discovery of a natural bed of potassium must then be considered as a happy event in industry.

There has just been published by Gauthier Villars, Paris, for 7fr., M. Dumas' thirty years' teachings in chemistry at the College de France.

As to fatal thunderstorms, we may mention that on the 25th January this year, when the clock tower of Toucy (Yonne) was struck, at 1.30 p.m., a thick cloud at little height began to lighten, covering the earth with large hailstones. Some minutes afterwards a thunder clap was heard, one alone, dry and prolonged; and, at the same time, the cross which surmounted the clock was surrounded by a luminous meteor. A woman in a room fifteen metres from the clock was carried to the other end of the room. Several persons were killed, and a man passing in the neighbourhood thrown to the ground.

RAILWAY APPLIANCES AT THE PHILADELPHIA EXHIBITION OF 1876.

THE important subject above mentioned formed the subject of an able and interesting paper by Douglas Galton, Esq., C.B., F.R.S., Associate of the Institution of Civil Engineers, read at that Institution on the 12th ult. In this paper it was stated that, although the first American railroad was only constructed in the year 1830, about 22,000 miles were in operation in 1856, and 74,600 miles in 1875. The difference between the American and the European railroad system is very marked. In Europe the railway was originally looked upon rather as a means of diminishing distance by high speeds than as the universal road for traffic. In America, where the railway had been the pioneer road of the country, and the sole means of communication, circumstance prevented the investment of more capital than was sufficient to make a line adequate to perform the duty immediately required of it. But, whilst the first cost was thus limited, considerable expense had to be subsequently incurred in perfecting the line. On the early American railroads the sleepers were laid on the soil, with little or no ballast. Sharp curves and steep gradients were the rule, so that a short rigid wheel base was imperative. Again, a car resembling the saloon of a steamboat was adopted, rather than a development of the body of a stage coach, as on European railways. The cars had central couplings, with end doors and steps, so that station platforms were unnecessary; and the traffic, until recently, had not demanded expensive signal arrangements. More responsibility appeared to have been thrown on the engine-driver, and improvement had been mainly in train appliances, such as brakes. It was believed that whilst the railways in Australia and other British Colonies and in India were still in their infancy, advantage would accrue from a careful consideration of the American system.

The subject was treated under the following heads:—I. Permanent Way; II. Cars and Car Fittings, including (a) wheels, (b) axles, (c) couplings, (d) springs, (e) brakes, and (f) heating apparatus; III. Locomotive Engines; IV. Railroads of 3-Feet Gauge.

The main features of the standard track of the Pennsylvania Railroad Company consisted in the shape of the head of the rail, the form of a splice for the joints, the large number of sleepers, and the arrangement of the ballast. The splices were 2 feet in length. The outside splice had a tongue which passed over the flange of the rail and was spiked to the sleepers. The joint was suspended midway between two sleepers. The surface at the formation level had slopes of 1 in 20 from the centre outwards, and the ballast was so laid as to allow the water to drain off rapidly. The weights per wheel in the heaviest engines were about 4½ tons. In connection with the permanent way, attention was directed to the Wharton switch, the principle of which was to carry the train off the main line on to a siding, without any break in the continuity of the main line rails.

The great distances on American lines had led to the conversion of the passenger cars into travelling hotels. The main advantage of the American form of car, which consisted of a long body supported at each end on a bogie truck, was the power of movement afforded to the passengers, and of access to conveniences. The disadvantages were, the mode of opening the windows, which slide up instead of being let down in the panels, and the difficulty of ventilation, but the latter had been overcome by a central raised roof with clerestory windows. A car for sixty persons had a length of body of 48 feet, a width of 9 feet 6 inches, and a height of 7 feet 10 inches at the sides, and of 10 feet 3 inches in the centre. Such a car would weigh, when empty, 650lbs., and when full 783lbs., per passenger. Sleeping cars for sixty-four persons were made with a body 61 feet long, and weighed, when empty, 812½lbs., and when full 915½lbs., per passenger. A class of vehicle, recently adopted, seemed likely to come into greater use. This was the Refrigerator Car, by which the produce to California was brought to the Eastern States, and the delicate fruits of the South and fish from the Gulf of Mexico were taken to Chicago. These cars were fitted with ice boxes, and were of various patterns. A very efficient cooling surface was provided by two ice chambers on each side of the car, or four in all, extending from the top to the bottom, and fed through hoppers in the roof. These boxes, being placed 3 inches from the sides, allowed a free circulation of air all round.

The use of chilled cast-iron wheels was all but universal on American railroads. Each wheel formed a single casting with the tire, and was cast in a chill, consisting of a rim of iron turned perfectly true, so that labour in turning was avoided. The necessary hardness in the chill was obtained by a mixture of charcoal iron, chiefly Salisbury iron, with broken up wheels and castings. The comparatively high price of charcoal iron had led to the substitution for it, in part, of anthracite iron, with wrought iron or Bessemer steel. A brief account followed of Messrs. Lobdell's mode of manufacturing wheels with charcoal iron, while the processes of other makers, and of Mr. Hamilton's successful use of anthracite iron, were briefly referred to. The duration of car-wheels in the United States was stated to be from 50,000 to 60,000 miles. They could then be turned up and run a further mileage. If turned before being used, Messrs. Lobdell guaranteed a duration of 90,000 miles. From numerous inquiries, the author had arrived at the conclusion, that good chilled cast-iron wheels were economical, and that they did not break in a way to occasion accidents to trains, provided they were periodically examined when running.

Three axles were noticed, in each of which the object was to allow the wheels attached to them to revolve independently. The construction of the Miltimore axle—one of this class—was described in detail, as with it there was a marked diminution of friction in passing round sharp curves. The results of two experiments were recorded, which showed in one case that there was a friction of 13·15lbs. per ton in the Miltimore axle, as against 17·21lbs, per ton with an ordinary axle, while in the other case these figures were 13·67lbs. and 26·55lbs.

The Miller coupling and buffer, now generally adopted in the United States for passenger cars, consisted of a spring buffer with a coupling immediately under the centre of the buffer. The buffer was in the plane of the sill of the car, and the compression was also in that plane, so that there was no tendency for the sill of one car to rise above the sill of the adjacent car. The coupling consisted of a broad catch attached to the end of a spring draw-bar. This hook caught the opposite hook sideways, as the elasticity of the head of the draw-bar afforded a slight lateral motion. When the cars were run together, the ends of the hooks first passed each other, then sprang back so as to form a secure clasp, the buffers being at the same time brought into compression. All this was effected without the use of links or pins, or the intervention of men to make the attachment. The uncoupling was accomplished by a vertical lever attached to the railing of the platform, the lever releasing one hook from its hold on the hook of the adjacent car. In springs, the greatest novelties were spiral springs in nests, and spiral steel springs combined with india-rubber.

The brakes on American railroads were, as a rule, capable of being applied to a larger number of wheels in a train than in this country. This had probably arisen from the greater necessity for the rapid stopping of trains, owing to the absence of secure fencing and the prevalence of single lines. It seemed to be recognised in the United States, 1st, that the engine-driver should have complete control over the application of brake-power to all the wheels of the train, and, 2ndly, that in the case of the accidental fracture of the couplings, the detached cars should be at once brought to rest by the action of the brakes attached to them. The Westinghouse automatic air brake was in extensive use on American railroads, especially for passenger trains. In it the air in the pipes was pumped in continually under pressure, and the brakes were applied by diminution of pressure. Smith's vacuum brake (the property of the Westinghouse Brake Company) was occasionally employed, where rapidity of action was not of paramount importance. It was less expensive, and its action was dependent upon a vacuum in the pipes.

The method formerly in use in America for heating the cars was by open iron stoves, but these had been the cause of many frightful accidents from fires. The Baker Car Warmer seemed now to be in great favour. In this the heat was applied by hot water pipes laid round the car on the floor-level, the water being heated by a coiled portion of the pipe being passed through a circular iron stove. The fire-box of this stove was of wrought iron, and this again was contained in a second covering of iron, which terminated in the chimney. No instance was on record of a fire having been occasioned in a train from these stoves. For the circulation, both ends of the pipe were inserted in a close cylindrical cistern on the roof of the car. The liquid used was a saturated solution of salt-water, as this solution did not freeze at ordinary low temperatures. The safety-valve had a compressible india-rubber ball, as the crystals of salt prevented a metal-seated valve from shutting tightly. The average allowance of heating surface in an ordinary car was 11 feet of 1¼ inch-pipe per passenger.

The striking fact gathered from the exhibition of railroad cars at Philadelphia was that, while the comfort of railway travelling had been practically stationary in Europe for the last twenty-five years, it had been rapidly developed in the United States within the last few years to a standard above that of Europe. The comforts were as much needed in Europe. The distances were as great; the cold was as intense; the populations to be accommodated were as numerous, and more wealthy. No doubt the control exercised by Continental Governments had had some effect in stopping improvements; but the author believed the stagnation was largely due to the use of small carriages divided into compartments. These had actually prevented the development of comfort, while the larger American car had both suggested and afforded scope for improvement. Until European Railway Companies followed the lead of America, and adopted long carriages on bogie trucks, comfort in travelling would remain in its present unsatisfactory condition.

Locomotive engines in the United States were of a totally different type to those in Europe. The front part of the engine was supported on a bogie truck, by which a short wheel base was possible. This truck was generally so arranged that the pivot was under the centre of the smoke-box, and the front wheels were considerably in advance of the body of the engine. When a bogie truck was not used, the front of the engine was carried (except in the case of a few special engines for inclines or for switching), by a Bissel two-wheeled "pony" truck, which had a swing bolster and a radius bar pivoting from a point about 4 feet behind the centre of the truck, the weight being equalized between the pony truck and the leading pair of driving wheels. The centre of the smoke-box was equidistant between the leading pair of driving wheels and the pony wheels. The cylinders were horizontal, placed low down between the front pair of wheels, and cast in one piece with the half saddle fitting round the bottom of the smoke-box, under the centre of which the two parts were bolted together. The cylinders were thus right and left indiscriminately, and a single pattern answered for both sides. The boilers were of charcoal iron or of homogeneous steel. The tubes were also of charcoal iron, lap welded. The fire-boxes were of American homogeneous steel, English steel, of a high temper, having been found to crack and blister. The particulars were given of five classes of engines, built at the Baldwin Locomotive Works, and of their performances. It appeared that the tractive force required to draw a train on an American railroad was less than on an English railway, so that either the train resistances were less or the average adhesion was greater. The dryness of the climate was more favourable to adhesion. In America, the average train resistances were diminished by the use of the bogie truck, possibly also by the employment of oil in the axle-boxes; but the main cause was dependent upon the short rigid wheel-base. If to this could be added some form of axle, such as the Miltimore, which would admit of the wheel moving independently, considerable economy in the tractive force required on railways would result.

Within the last few years companies had been formed to build in America 8,000 miles of narrow-gauge lines, of which 2,700 miles were in operation at the beginning of 1877. The Denver and Rio Grande Railroad was proposed to be 1,700 miles long, and between 200 and 300 miles had been completed. The promoters of this system contended that a mile of single line having a gauge of 3 feet could be made for £1,904, with rails weighing 30lbs. to the yard, or for 2,144, with rails of 40lbs. to the yard, while the rolling stock might cost £758 per mile, calculated for a length of 100 miles of road. The details were added of the engines and rolling stock for a gauge of 3 feet, and a contrast was made between it and the stock for a gauge of 4 feet 8½ inches. The 3-feet gauge railroads were introduced in the United States as economical pioneer lines, and so long as they were retained in that capacity they might be useful for opening out a country where the traffic was small. They had also been found peculiarly applicable in penetrating into the narrow canons and gorges in the hills of Colorado. But it was certain that where special conditions did not prevail, and as the traffic increased, the inconvenience of a break of gauge would be more serious, and a wider gauge would be found preferable. It was, however, worthy of consideration, whether in the Colonies narrow gauge railroads, of cheaper construction and with cheaper plant than the 4 feet 8½ inches gauge, might not be advantageously adopted, and amply suffice for the wants of such communities.

Society of Arts Blowpipe Prize.—The Society of Arts has at last awarded the prize which it offered, of £10 and the silver medal of the society, for the best set of blowpipe apparatus which could be sold retail for one guinea. The prize has been won by two Cornishmen, Messrs. Letcher (of St. Day) and Camborne.

THE TELEPHONE AT THE INVENTORS' INSTITUTE.

At the meeting of the Inventors' Institute on the 28th February last, Admiral Jasper Selwyn in the chair, there was a numerous attendance of ladies and gentlemen.

Mr. T. McCrarie exhibited a telephone arranged in a cheap and generally available manner. The instrument was then described. It had a hollow handle and mouthpiece to speak and hear with, and there was a similar handle at the other end of the wire, with which the opposite party could speak and hear. The magnet was a round piece of hardened steel magnetised, and that was placed into the hollow or bed of the handle, and about the 30th of an inch below the bed. There was then placed on the top of this a plain bobbin, thin enough to see through, with about thirty yards of copper wire round it. The beginning and finish of the wire were placed in two holes in the end of the magnet. There was over the top a thin plate of wire, and the top was tightly screwed down; the tube passed through two holes at the lower end of the handle which communicated with the magnet, and in this state the telephone was ready for operation.

Mr. G. E. Pritchett, F.S.A., architect, then exhibited two improvements on the Graham Bell telephone, by which it could be applied with great profit to the Press. The first was an instrument by which six or even twelve persons could hear the same message, and thus write simultaneously. The second consisted of a portable telephone, with a cap from which two tubes projected. The telephone is fixed to a convenient part of the coat with what resembled a letter clip. The longer tube passes round the neck, and is placed in the right ear and the centre one on the left. The wire may be suspended from the ceiling, and the party receiving the message may be dictating instead of walking about the room. Over the head a band is placed with pads, opposite the ears, composed of felt and soft gutta-percha, so that the ear may not be injured, and into these the tubes are placed. All outer sound is thus shut out. He said he would take as an illustration the *Daily Chronicle* when at a late hour in the House of Commons was pressed for time, the conclusion of the debate was desired; but it took some time to send it by wire. With this instrument they could have at the office every word as fast as it was written by the reporter, or, if need be, the reporter could dictate it from his notes. In answer to a question, Mr. Pritchett said that his improvement had been tested for miles, and was found to work well.

After the paper had been read, the **Chairman** invited discussion, and in doing so remarked that the Inventors' Institute entertained a very strong feeling in regard to the propriety of giving all the support in its power to the claims of inventors, and therefore he considered it his duty to point out that, although Mr. McCrarie deserved their thanks for having been at the trouble to bring his models and specimens under the notice of the members and friends of the Institute, yet, speaking on its behalf, he must inform him that his arrangement of the telephone, although ingenious, simple, and portable, was so similar to Professor Bell's that he must not be surprised if it should be declared an infringement of Professor Bell's patent. As regarded Mr. Pritchett's invention, he would just remark that it appeared to be an ingenious and useful adjunct to Professor Bell's invention.

Mr. F. W. **Campin**, the Secretary, here explained that Mr. McCrarie had brought his telephone before the Institute with the view to obtain an expression of opinion, not only as to the advantage of his arrangement of the instrument, but also in regard to its relation to Professer Bell's invention.

Dr. J. **M'Grigor Croft** said he could not help remarking that, giving every credit to Professor Bell for his persevering efforts to bring the telephone into a practical and available form, still he could not regard him as the originator of telephones. With reference to Mr. Pritchett's invention, he must say he regarded it as a very ingenious and useful one.

Mr. **Faulding**, jun., who gave the company the benefit of his practical knowledge of electrical apparatus, by aiding them in making practical trials of the instruments, expressed his opinion that the telephone was in a complete state of infancy, and that much remained to be done before it could be considered perfect in its action.

After remarks from other gentlemen present,

The **Chairman** proposed a vote of thanks to Mr. McCrarie and Mr. Pritchett.

Mr. **Blanchett** seconded this proposition, which was carried unanimously.

This having been duly responded to, a vote of thanks to the Chairman terminated the proceedings.

MR. ANDERSON'S PATENT LAW AMENDMENT BILL.

This Bill is endorsed as "prepared and brought in (to the House of Commons) by Mr. Anderson, Mr. Mundella, Mr. Dalrymple, and Mr. Alexander Brown." It contains the following provisions, numbered in accordance with its clauses:—

(1). The Act to come into operation 1st January, 1879.

(2). The duration of Letters Patent to be 21 years (instead of 14, as now).

(3). Letters Patent already granted to be subject to the Schedule of Stamp Duties of this Bill, and on payment of the duties at 7 and 14 years, to be thus extendible to 21 years. (No payment being required at the third year, as is now the case.)

4 and 5 approppropriate the duties named in Schedule to the Crown, and state short title.

Schedule.

On Petition for Grant of Letters Patent, £2 10s.; Certificate of Notice to Proceed, £2 10s.; Warrant of Law Officer, £2 10s.; Sealing, £2 10s.; Specification, £2 10s.; at end of 7 years, £25; at end of 14 years, £50. Other incidental duties, same as under old Act.

APRIL.

(From the French of Victor de Laprade.)

'Tis I, who through thy lattice lance
These joyous rays of gold divine,
Whose living fire can e'er enhance
The thoughts which in thy dark eyes shine!

Close thou thy faded book, and bid
Thy sombre dreamings all away!
Nor linger mid the streets that hid
My waking which the fields display.

I am the springtide! God hath blent
My radiant spell of song and flower
And life and light with me hath sent
To every soul—to every bower!

V. Gonville D.

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Past Presidents:

SIR DAVID BREWSTER, K.H., LL.D., F.R.S., &c., from the establishment of the INVENTORS' INSTITUTE, till his decease, February, 1868. LORD RICHARD GROSVENOR, M.P.

President, SIR ANTONIO BRADY.

SESSION 1877—1878.

MEMBERS' MEETING.

At a Quarter-past Eight in the Evening,

On Thursday, 11th April, Patent Law Conference, with special reference to Mr. Anderson's Patent Law Amendment Bill.

On Thursday, 25th April, Exposition of Inventions and Patent Law Conference.

Executive Councils at half-past Seven on same evenings.

Subscriptions are payable to Mr. G. A. STRETTON, the Receiver, 4, St. Martin's-place, S.W., who is the proper official to give receipts.

F. W. CAMPIN, Sec.

Proceedings of the Institute.

THE paper by Mr. F. W. Campin (the Secretary of the Institute), on "Trade Marks as affecting Inventions," appointed to be read on 14th March, was, from unavoidable circumstances, postponed to a future day.

On 28th March, Mr. W. C. Hughes' paper "On Lighting, &c.," was read; but we are compelled to reserve our report for a future opportunity.

We are also compelled to reserve our reports of Executive Councils.

Monthly Notices.

Pneumatic Clocks are becoming a fashion in Paris and in Vienna. Air is compressed into and preserved in a central reservoir. From this pipes are carried and laid down to any number of houses, and attached to the clocks; the pendulum releases uniformly the same measure of air which moves the clock work, so that time is "laid on," just as are water and gas.

Telephonic Improvements.—M. Demoget, as stated in the *Comptes Rendus*, finds that if two plates of iron, similar to the ordinary vibrating plate of the telephone,—one with a hole equal to the diameter of the magnetic bar, and the other with one a little larger,—be placed near the vibrating plane, the intensity of the sound transmitted is increased and at the same time rendered much clearer.

The artificial formation of rubies and other gems is fully described by the *Publication Scientifique Hebdomadaire*, 363^{me} Lettre-Causerie, the processes adopted by MM. Fremy and Feil in producing those reproductions of natural gems being therein fully stated.

The applications of electricity to useful purposes are distinctly advancing, as witness the fact that the lighthouses at the Lizard blaze with the electric light apparatus. The Alexandra and the Teméraire ships are already adjusted with the electric light apparatus, and the double turret ship Monarch is ordered to have the electric lamp, so that by illuminating the sea around them these ships may at once detect the dangerous advances of the torpedo. Again, on the 6th ult., Mr. St. George Lane Fox read before the Society of Arts a paper "On Automatic Gas Lighting," and, as a matter of science deserving record, the idea of lighting lamps by electricity is now being tested on the street-lamps in Pall Mall. While we gossip on the uses of electricity we find the "Sun" Automatic Gas Machine and Lamp also claiming attention. Atmospheric air under pressure is driven through benzoline, gasoline, and some other hydro-carbon, and burnt directly at its outlet, in a lamp. The collector of dues at the Ferry at Kessock, Inverness, says he has used this light for more than a year with considerable satisfaction.—*Athenæum.*

A trade in human jaws is stated in the *Scientific American* to be the result of the Turkish war. They are collected in Bulgaria and consigned in large quantities to Paris. The lower jaws are selected, and their value depends upon the soundness, regularity, and whiteness of the teeth, which are extracted on their arrival and used for dental purposes.

A specimen of alexandrite from the Ural mountains was recently exhibited by Mr. George F. Kunz, at the New York Academy of Sciences. It is purple by night and deep green by day. He also showed a specimen of harmotone, a silicate of baryta and alumina, from a new locality in Brazil.

Anchorite from the Phœnixville Tunnel, and *fulgurites* from Carrol County, Ill., were also exhibited at the above-named institution. The latter are partially fused with vitrified tubes of sand produced by the action of lightning.

Sir George Gilbert Scott, R.A., the eminent Architect, died suddenly of heart disease on 27th March.

The Eurydice was lost recently in a sudden storm, and a large number of men have perished. It is to be hoped this case will be strictly inquired into. It is all very well to say nobody is to blame, but let this be proved to the public.

Hundred ton Guns.—The four guns of 100 tons each, which have been purchased by the Government from Sir William Armstrong, will, it is reported, until the navy is prepared to receive them, be mounted on the land defences at Malta, Gibraltar, or at home. It is unlikely that either of them will be brought to Woolwich for preliminary experiments, as the Government have the advantege of the trials made with the first of the five guns which the Italians purchased for about £16,000 apiece. It is understood that the sum paid by the English Government is somewhat below that figure. The Woolwich 80-ton gun has, in proportion to its size, displayed a greater energy than those just acquired, but the latter throw a projectile 300lbs. heavier, the bore being 1¾ins. larger.

A Wafer Great Seal, with one side device only, has been substituted for the old lump of wax impressed on two sides by the Great Seal of the United Kingdom. The Patent document is now in letterpress print, of that inferior kind often adopted for cheesemongers' handbills.

The Scientific Review.

APRIL, 1878.

WORDS TO THE ENEMIES AND FOR THE FRIENDS OF INVENTORS.

"Sow the wind and reap the whirlwind," is an apothegm coming from a high source, and the lesson it teaches us is one of the deepest gravity. How little this lesson seems to be heeded by certain men who take an active part in political life, anyone who has kept himself *au courant* with their recent sayings and doings will readily admit. With what is usually known as politics the SCIENTIFIC REVIEW has luckily nothing to do; but as regards Parliamentary and Government proceedings with reference to the Patent Laws and some other industrial and social questions, we are bound to signify our approval or to stimulate opposition, in accordance with our views of the right and wrong of the matter.

This view of our duty renders it necessary that we should at the present time take note of some things which have recently been passing in the Houses of Parliament, and some action that has been taken by the Government with regard to Letters Patent for Inventions.

In the House of Lords, that old enemy of Inventors, Lord Granville, has again let the world know that he, the possessor of special privileges as a Peer of the realm, accruing to him proximately by the accident of birth—originally by the mere *grace and favour* of the Sovereign of the realm, and *assured to him by Patent*—is the deadly enemy of *any Patent Right*, —or, as some term it, privilege—being conferred upon Inventors, in respect of the products of their intellect and industry as embodied in their own Inventions.

Lord Granville, doubtless desiring to keep himself well before the public as a Liberal statesman, and freetrader even *ad absurdum*, recently rose up in the House of Lords, and interrogated the Lord Chancellor as to the intentions of the Government in regard to Patent Law Reform, and in doing so referred to his own well-known hostility to Patents for Inventions, which he shares with Lord Selborne and other Peers; at the same claiming the Lord Chancellor as a sympathizer in his views, as to which, however, the Lord Chancellor made no sign.

We cannot but admire Lord Granville's hardihood in his open and reiterated avowal of enmity to Inventors, for, it must be remembered, his idea as to Inventions is, that they ought to be common property, or, in other words, *Nationalised*. Now, if Inventions, which are indubitably the creations of Inventors, be thus dealt with, why should we not have property in land *nationalised* bearing in mind that this latter kind of property is founded on *mere appropriation*, and not on origination; in some cases being even what has been termed *thief-hold*. If we are to have communism, let it be communism all round; do not let us apply that system to only one class of people.

My Lord Granville may take our word for it, that if Inventors are treated in this way, they will demand that Lords and Landowners shall be made to follow suit. It may be all very well for his Lordship to go and preside at the dinner of the Foremen Engineers' Society, as he recently did, and pat on the back that very valuable body of men (though, by the bye, we must express our astonishment at that body asking such a deadly enemy to one of their best interests—remuneration for any inventive efforts they may make—to fill such a position). But, for all that, it would be found, if ever Lord Granville's theories came to be practically tested, that ingenious men would not rest content with empty praise instead of solid pudding, and the state of serfdom to which money Lords would like to reduce intellectual labour—as they have aforetime reduced other labour —would not in these days last very long. Surely the spread of communistic sentiments amongst working people in France and Germany, public evidence of which has been recently placed before the world, ought to be a warning that a feeling of discontent pervading the ranks of labour, as regards the antagonism, as they view it, of capital or property, is no light matter, and that it would be wise to foster rather than discourage the idea that, at the very least, one source of property (Invention) is open to all men. If Lords and senators care not for considerations of public welfare, as regards the promotion of industrial improvement, which is wholly dependent on Invention, let them not imperil their own individual interests.

Having thus chronicled some doings hostile to the Inventor's cause, let us now look at some friendly proceedings. Though we must confess it looks something like the mountain in labour bringing forth a mouse—the *ridiculus mus*—for the present Government, after having in three different Sessions, of Parliament brought in Bills professedly to reform the Patent Laws in a comprehensive way, to have at last achieved the small reform of suppressing the large lump of wax yclept the Great Seal, and adopted a neat wafer seal, which, however, is of similar device to only one half of the *Great Seal* (that is one side) as to which it may be noted that the Act, 40 and 41 Vict., cap. 41, requires that the wafer seal shall be of "*the same device*" as the Great Seal, and one cannot well understand how *one half of a device* can be called the *same device* as the whole.

Friendly action to Inventors is not, however, confined to this modicum effected by the Government, for Messrs. Anderson, Mundella, Dalrymple, and Brown have laid before the House of Commons a Bill to amend the Patent Law by reducing the stamp duties, the details of which are given in another column. We wish this friendly movement every success, and the machinations of our enemies the utmost confusion.

Proceedings of Societies.

ROYAL SOCIETY.

Feb. 21st.—Sir J. Hooker, President, in the chair.—The following papers were read: "On the Alteration of the Thermal Conductivity of Iron and Steel caused by Magnetism," by Mr. H. Tomlinson; "Chemical Notes on the direct Formation of the Chloro-bromides, Chloro-bromide of Ethylene ($C_2H_4Cl.Br$)," by Dr. M. Simpson; "Further Note on Supersaturated Saline Solutions," by Mr. C. Tomlinson; and "Sur une Equation différenticlle du 3^{me} Ordre," by Prof. F. Brioschi.

Feb. 28th.—Sir J. Hooker, President, in the chair.—Sir W. H. Gregory was admitted into the Society. The following papers were read: "On Certain Definite Integrals," by Mr. W. H. L. Russell; "On the Reversal of the Lines of Metallic Vapours," by Profs. Liveing and Dewar; and "Contributions to the Physiology of Batrachian Lymph Hearts," by Mr. J. Priestley.

March 7th.—Prof. Abel, V.P., in the chair.—The names of fifty-six candidates for election were read. The following papers were read: "On the Photometry of the Magneto-Electric Light," by Capt. Abney; "Experimental Researches on the Temperature of the Head," by Dr. J. S. Lombard; and "Addition to Memoir on the Transformation of Elliptic Functions," by Prof. Cayley.

GEOGRAPHICAL SOCIETY.

Feb. 25th. — Sir R. Alcock, President, in the chair. The following gentlemen were elected Fellows: Capt. T. C. R. Colomb, Lieut.-Col. J. Jago, Vice-Admiral G. G. Randolph, Rev. J. E. White, Messrs. J. Brand, P. Cooper, and W. Turnbull. The paper read was "On Armenia and Mount Ararat," by Mr. J. Bryce.

March 11th.—F. Galton, Esq., in the chair. — The following gentlemen were elected Fellows: Major G. R. S. Black, Major E. S. Gordon, Col. J. T. Griffin, Col. Wilkinson, Lieut. Hon. F. Elliott, Lieut. J. M. Grant, Hon. T. Elder, Rev. D. D. Mackinnon, Rev. G. Prothero, Messrs. H. B. Banks, H. W. Birks, J. Bowles, J. C. Burnett, F. H. Butler, W. A. Duncan, R. C. Downer, J. Galbraith, G. Jinman, A. M'Alister, W. H. Muggeridge, G. Oliver, G. W. Paine, G. R. Shaw, and G. T. Wickenden. The lecture delivered was "On the Magnetism of the Earth," by Capt. F. J. Evans.

BRITISH ARCHÆOLOGICAL ASSOCIATION.

Feb. 20th.—H. Syer Cuming, Esq., in the chair. — Among the antiquities exhibited were a silver ring with a representation of the Crucifixion in relief, belonging to Mr. Mould, and a Spanish cross of steel, dated 1620, with a central medallion of the Virgin, exhibited by Luxmore. Mr. W. Smith explained a large collection of flint instruments found by him at Dunstable. The soil is chalky, with flints, and the implements, which consist of scrapers and spear-heads, are of similar flint. Mr. Loftus Brock exhibited three remarkable late Roman vessels recently found in London; one, a drinking jug, from Throgmorton-street, being very similar in form to some of Scythian manufacture. The Rev. S. M. Mayhew produced specimens of Roman glass also from London, and pewter vessels of early seventeenth century date. Mr. H. Fisher exhibited two "Couteaux de chasse," which had belonged to his family for generations, and of which one was believed to have belonged to Sir Francis Drake. The date was evidently the latter part of the sixteenth century, and the workmanship probably German, while the second was Dutch. The first paper was read by Mr. Syer Cuming, and was "On St. Christopher." The lecturer exhaustively treated this legendary history, affirming that it must be accepted purely as a myth. St. Christopher was credited with power to deliver his votaries from sudden death, terrors of the night, and other dangers. Traces of paintings and other relics of him are so numerous still in churches that they have been met with in fifteen counties in England, although but few churches are dedicated to him. Several taverns are still called by his name. In the discussion which ensued Mr. Jenner pointed out that, of recent times, since the Council of Trent, the Roman Catholic Church had practically given up the invocation of St. Christopher. The second paper was by Mr. De Grey Birch, "On the Compotus Rolls of Oundle Manor." These documents belong to the Association, and contain many most interesting references to the value of labour and materials in the fourteenth century. The third paper was by Mr. Dymond, "On Cumbrian Megaliths." He described some little-known objects of remote antiquity in Cumberland, and illustrated his paper by a series of plans measured and drawn for the purpose.

March 6th.—Mr. H. Syer Cuming in the chair.—The Honorary Secretary announced that the invitation of the Mayor and Corporation of Wisbech had been accepted for the Association to visit that town for the purpose of holding the annual Congress there; visits would be made to Ely, King's Lynn, Thorney and Croyland Abbeys, and to several of the Marshland churches. Mr. Prigg exhibited a large collection of antiquities recently found near Bury St. Edmunds, among which was a gilt fibula of Saxon dates, of much beauty. Mr. Way produced an effigy of Charles the First, evidently cut from the "Pax" Medal commemorating the marriage with Henrietta Maria, and used as a tobacco-stopper by some devoted Royalist. The medal was at hand in its entirety for comparison, since by chance it was one of Mr. Prigg's exhibits. Mr. Luxmore showed some minutely cut examples of Spanish ironwork, and the Rev. S. M. Mayhew sent some early relics from old London, some of which were found on the site of old St. Midred's Church. Poultry. Mr. Halsey exhibited, and Mr. W. de Gray Birch described, four early thirteenth-century documents relating to property in Mr. Halsey's possession. Mr. W. Smith exhibited another collection of pre-historic flint implements from Dunstable, found on the surface of the ground; and Dr. Stevens described some somewhat similar relics from Andover, found in connection with early "pit dwellings." Mr. L. Brock produced an elaborately ornamented thirteenth-century jug, and some Roman relics found in Mincing-lane. The first paper was read by Mr. R. Allen, "On the Ancient Interlaced Crosses of England." The lecturer elaborately treated his interesting subject, and produced a large collection of rubbings from the objects themselves. The extent of the districts in which these crosses are found and the great resemblance in style point to a common origin. They range from about A.D. 600 to 1,000, as can be well made out by gradation of style and inscription. The second paper was read by Mr. H. S. Cuming, who traced the origin of "money bags" in remote times, and produced specimens of later date. Illustrations of several of the Roman period were shown, and many references to old authors were given.

NUMISMATIC SOCIETY.

Feb. 21st.—J. Evans, Esq., President, in the chair.—Mr. W. Buttery was elected a Member, and Prof. Dr. T. Mommsen and M. le Vicomte Ponton d'Amécourt were elected Honorary Members. The Rev. Canon Pownall exhibited a farthing of Richard the Second, found near Stamford, with pellets in the quarters, similar to No. 322 of Hawkins's "Silver Coins of England." *Obv.* RICARD, REX ANGL.; *rev.* CIVITAS LONDON; weight 4·02 grains. Mr. Evans exhibited, in illustration of the type of the same, specimens of the noble, half-noble, and quarter-noble of Richard the Second. Mr. H. S. Cuming exhibited some small brass coins of Constantine the Great. Mr. Percy Gardner read a paper on some coins of the Seleucidæ struck in European Greece, and identified as portraits of Antiochus III., certain coins struck by the Ætolians and the people of Carystus in Eubœa; he also suggested that the veiled female head on the later tetradrachms of Chalcis in Eubœa might be a portrait of the wife of Antiochus, an Eubœan lady whom he married during his sojourn in that island. The reverse type of the same, a victorious chariot commemorating the games celebrated on that occasion. Mr. C. Patrick contributed the third portion of a paper "On the Metallic History of Scotland."

LINNEAN SOCIETY.

Feb. 21st.—Mr. W. Carruthers, V.P., in the chair.—Dr. Hance, of China, Mr. E. Milner, Dr. G. Shearer, and the Rev. R. B. Watson were elected Fellows. Mr. H. Christy illustrated by diagram and made some remarks on M. Ossenkeps' new system of plant propagation; and he also showed the recently imported fresh berries of the Liberian coffee of this year's crop. Mr. Holmes exhibited a remarkable oak gall of *Aphilothrix Sieboldii*, Hart, obtained at Willesboro,' Leas, Ashford. Mr. Thiselton Dyer exhibited and made a few observations on the inflorescence and a drawing of the palm *Pthychosperma rupicola*, Thw., which had flowered for the first time in Europe at Kew. A paper was read, "Notes on the Mahwa Tree (*Bassia latifolia*)," by Mr. E Lockwood. This tree grows in abundance in India; a hundred thousand may be seen on the plains around Monghyr. Wild animals of all kinds greedily devour the flower, of which one tree will yield several hundred-weights. Besides being nutritious to man, it is an excellent fattening agent for cattle. A strong-smelling spirit is obtained by distillation of the corolla, an essential oil from the fruit, and as an agent in soap-making the tree is invaluable. Thus certain yield, unlimited supply, nourishing and chemical qualities, easy preservation, and its cheapness, all combine hereafter to render it a commercial product of no mean importance to our Indian empire. The gist of a "Synopsis of the Hypoxidaceæ," by Mr. J. G. Baker, was given. Four genera and between sixty and seventy species are now known. The Cape is their head-quarters, but some are found in Tropical Africa and Angola, a very few in Abyssinia and the Mascarenes. None are found in Europe, Polynesia, North and Central Asia, nor in extra-tropical South America. The Secretary read an abstract of a technical paper, "On the Schœpfieæ and Cervantesiiæ, distinct tribes of the Styraceæ," by Mr. John Miers, F.R.S. Then followed a communication by Mr. A. G. Butler, "On the Butterflies in the Collection of the British Museum hitherto referred to the genus Euplœa of Fabricius."

March 7.—Dr. Gwyn Jeffreys, V.P., in the chair.—Mr. C. P. Hobkirk was elected a Fellow. Mr. T. Christy exhibited a series of fruits, among which were Chinese quinces, chayottes, and a remarkable citron, known in China as the "claw of Buddha." Professor Ray Lankester also brought forward and made remarks on a collection of fossil walrus tusks (*Trichecodon Huxleyi?*) from the Suffolk Crag, sent him for examination by Mr. J. E. Taylor, of the Ipswich Museum.—Examples of a variety of *Helix virgata* were likewise shown by Mr. Rich.—"On Nudibranchiate Mollusca from the Eastern Seas," by Dr. C. Collingwood, was the first paper read. He remarks that residents searching carefully within limited areas have more chance of obtaining new and interesting forms than zoologists or equipped expeditions, who but pay hurried visits to tropical coasts.

Season and other influences have much to do with abundance or paucity of species in given localities. He gives curious instances of specimens isolated in a dish of sea-water spontaneously and uncommonly neatly amputating the region of their own mouths. With other information the author proceeds to describe some sixteen new forms, illustrating the same with coloured drawings from nature. Mr. T. Meehan's paper, "On the Laws governing the Production of Seed in *Wistaria Sinensis*," was communicated by the Rev. G. Henslow in the absence of the author. The latter alludes to the fact that the Wistaria when supported grows amazingly, but is seedless; on the contrary, the self-supporting so-called "tree Wistarias" produce seeds abundantly. These cases illustrate the difference between vegetative and reproductive force. They are not antagonistic, but supplement each other. While Wistaria flowers freely without seeding, it has been supposed this arises from the bees not cross-fertilizing. Mr. Meehan submits data, however, in which he thinks the question lies rather in the harmonious relation between the two above nutritive powers than with insect pollenisation. The Rev. M. J. Berkeley, in an "Enumeration of the Fungi collected during the Arctic Expedition, 1875-6," mentions twenty six species were obtained, all determined save two. Seven are new species, and seventeen already-known widely distributed forms. The *Agaricus Feildeni* and *Urnula Hartii* are unusually interesting. A paper "On the Development of *Filaria sanguinis hominis*, and on the Mosquito considered as a Nurse," by Dr. P. Manson, was read by Dr. Cobbold. Discussing several general questions, the author proceeds to show that the female mosquito, after gorging with human blood, repairs to stagnant water and semi-torpidly digests the blood. Eggs are deposited, which float on the water, and become the familiar "jumpers" of pools. The filaria thus enter the human system along with the drinking water. Dr. Manson got a Chinaman, whose blood was previously ascertained to abound with filariæ, to sleep in a "mosquito house." In the morning the gorged insects were captured and duly examined under the microscope. A drop of blood from the mosquito was thus found to contain 120 filariæ, though a drop from a prick in the man's hand yielded only some thirty. The embryo once taken into the human body by fluid medium pierces the tissues of the alimentary canal. Development and fecundation proceeds apace, and finally the filariæ met with in the blood are discharged in successive and countless swarms—the genetic cycle being thus completed. Dr. Cobbold, on his own behalf, further contributed a paper "On the Life History of *Filaria Bancrofti*, as explained by the Discourses of Wucherer, Lewis, Bancroft, Manson, Sonsini, and others."

ZOOLOGICAL SOCIETY.

Feb. 14th.—Prof. Mivart, V.P., in the chair. The Secretary exhibited the skin of a Cassowary, obtained at Wandammen, on the eastern coast of the Bay of Geelvink, New Guinea. The species to which it belonged was believed to be undescribed, and was proposed to be called *C. altijugus*, from its peculiar high-peaked helmet. Papers were read: by Mr. P. Geddes, "On the Mechanism of the Odontophore in certain Mollusca;" by Prof. A. H. Garrod, on the anatomy of *Tolypeutes tricinctus*, and on other Dasypodidæ: a new form of Tolypeutes, allied to *T. conurus*, was proposed to be called *T. Muriei*; from J. H. Gurney, on a specimen of Polyborus lately living in the Society's Gardens; from Mr. D. G. Elliott, on the Pteroclidæ, or Family of Sand Grouse: nine species of Pterocles and two of Syrrhaptes were recognised as composing the family; by Messrs. F. Du Kane Godman and O. Salvin, on new species of Diurnal Lepidoptera from Central America; from Mr. R. B. Sharpe, on a small collection of Birds from the Ellice Islands; by Mr. E. R. Alston, on the dentition of Caseus; from Mr. T. F. Cheeseman, containing the description of three new species of Opisthobranchiate Mollusca from New Zealand; by Dr. F. Day, on the paper read by Mr. Whitmee at the last meeting of the Society, on the manifestations of fear and anger by Fishes; from the Marquis of Tweeddale, on a collection of Birds made by Mr. A. H. Everett in the Island of Negros, Philippines; and from the Marquis of Tweeddale, on a new species of the genus Buceros, proposed to be called *B. semigaleatus*, from the Island of Leyle, Philippines.

March 5th.—Prof. Newton, V.P., in the chair.—The Secretary read a Report on the additions made to the Society's Menagerie during February, and called special attention to a pair of Persian Leopards, deposited by Capt. Phillips. Mr. Sclater, exhibited and made remarks on a second collection of Birds from Duke of York Island, New Britain, and New Ireland, received from the Rev. G. Brown, and upon a specimen of *Athene variegatæ*, and upon the type-specimen of *Fulica gallinuloides* of King, belonging to the Museum of Science and Art, Edinburgh. Prof. Newton drew attention to the statement of Leguat that every Solitaire (*Pezophaps solitaria*) carried a stone in its gizzard, and exhibited one of three stones found by Mr. Caldwell, associated with the remains of as many birds of that species in the caves of Rodriguez.—Mr. T. J. Parker described the stridulating apparatus of *Palinurus vulgaris*, which consisted in a peculiar modification of the second joint of the antennæ working against the lateral surface of the antennulary sternum. Communications were read: from Mr. C. S. Bate, "On the Crustaceans of the Coast of Coromandel, collected by Sir. W. Elliott,"—by Mr. A. Boucard, "On some Coleoptera of the genus Plusiotis, and three new Species from Mexico and Central America,"—from Mr. A. G. Butler, "On a Small Collection of Lepidoptera, obtained by the Rev. J. S. Whitmee at the Ellice Islands,—from Mr. E. J. Miers, "On the Penæidæ in the Collection of the British Museum,"—by Mr. G. F. Angas, "On a new Genus of Land Shells belonging to the Family Cyclophoridæ," for which he proposed the name of Mascaria, and "On Nine new Species of Land and Marine Shells from various Localities,"—from Dr G. E. Dobson, "On the Chiroptera of Duke of York Island and the adjacent parts New Ireland and New Britain,"—and from Mr. R. Collett, "On Latrunculus and Crystallogobius, two remarkable forms of Gobioid Fishes found in Scandinavia."

CHEMICAL SOCIETY.

Feb. 21st.—Dr. Gladstone, President, in the chair.—A lecture, entitled "Laboratory Experiences on board the Challenger," was delivered by Mr. J. Y. Buchanan. After describing his laboratory, which measured 10 feet by 5 feet 8 inches, and 6 feet high, and its fittings, the lecturer gave a detailed account of the means by which, after estimating the compressibilities of water and mercury, he was enabled to determine the depths and temperatures obtained by the sounding-line. The compressibility of distilled water was found to be 0·000049 per atmosphere, or 0·0009 per 100 fathoms; of sea water, 0·00077 per 100 fathoms; and of mercury 0·0000271 per 100 fathoms, or 0·0000015 per atmosphere. He then described the apparatus and methods by means of which the amounts of oxygen, nitrogen, and carbonic acid were determined. The most interesting results obtained were the following:—From the surface down to 300 fathoms, the amount of oxygen continuously decreases; from 300 fathoms downwards, whatever be the depth, the amount increases. This anomalous result the lecturer stated to be due to the great abundance of animal life at the depth of 300 fathoms, the increase in the quantity of oxygen at greater depths being caused by its non-consumption, owing to the scarcity of life. The next part of the lecture dealt with the distribution of the sea water as regards density, in depth and superficially. Two regions of maximum density exist north and south of the Equator, corresponding to the tracts frequented by the trade winds. At 350 fathoms deep, a great zone of water of low density is found. The densest water is found in the Atlantic. Light water is found in the neighbourhood of ice, and in certain regions immediately after the cessation of the monsoons. The maxima of density lie in the North Hemisphere to the south-west, in the South to the north-west of the maxima of barometric pressure.

March 7th.—Dr. Gilbert, V.P., in the chair.—The following papers were read: "On some New Derivatives of Anisoil," by Mr. W. H. Perkin. The author has obtained orthovinylanisoil, boiling 195-200° C., sp. gr. at 15° 1·0095; orthoallylanisoil, boiling 222-223° C., sp. gr. at 15° 0·9972; and orthobutenylanisoil, boiling 232-234°, sp. gr. at 15° 0·9817. The author compares the physical properties of the ortho and para compounds; the former boil about 10° lower, have a slightly higher specific gravity, and crystallise with much greater difficulty. "Note on the Action of Ammonia on Anthrapurpurin," by Mr. W. H. Perkin. The author has investigated the colouring matters produced by the action of heat on an ammoniacal solution of anthrapurpurin in sealed tubes at 100° and 180° C. At the former temperature an unstable substance was obtained dyeing alumina mordants purple, and weak iron mordants indigo blue. At 180° a new substance, anthrapurpuramide, was formed, which does not dye mordants. "On Certain Polyiodides," by Mr. G. S. Johnson. The author attempted, without success, to prepare a compound having the composition $AgKI_6$, or a similar substance, having thallium in place of silver; various compounds of silver and potassium, thallium and potassium, and especially a very complicated substance, containing lead, acetic acid, potassium, and iodine, were formed and analysed. The latter substance crystallises in square prisms; of the six faces, two have a dark purple and four a greenish-golden reflection. "On an Improved Form of Wash-Bottle," by Mr. T. Bayley. The object of this contrivance is to prevent the reflux of steam or other gases, such as ammonia, into the mouth of the operator, without losing the advantages of the ordinary wash-bottle. "On the Preparation of Glycollic Acid," by Mr. R. T. Plimpton. The author endeavoured to prepare this substance by the method recommended by Prof. Church, but obtained quantities too small for analysis; two ounces of oxalic acid were used.

METEOROLOGICAL SOCIETY.

Feb. 20th.—Mr. C. Greaves, President, in the chair.—Dr. Tripe read a paper "On the Winter Climate of some English Seaside Health Resorts (Torquay, Penzance, Guernsey, Barnstaple, Ventnor, Llandudno, Ramsgate, and Hastings)." The results may be briefly summed up as follows, viz., the mean daily winter temperature of these seaside places, and especially those situate on the coast of Devon and Scilly, is higher than at London; the mean daily maxima and minima are also higher, and especially the latter, so that the daily and monthly ranges of temperature are smaller; the mean humidity is less, the general direction of the wind about the same, but the number of rainy days and the rainfall are greater at the seaside. As regards the wind, therefore, the chief point to be especially noticed is the amount of shelter afforded by high land, as at Ventnor, and especially of protection against the stormy and cold winds which ordinarily prevail at the end of February and in March. The soil also should be considered, as heavy rains at gravelly and chalky places are not so objectionable as on clayey ground. The discussion on the paper was adjourned until the next meeting. The following candidates were elected Fellows: Miss E. A. Ormerod, Rev. J. A. L. Campbell, Lieut. C. S. F. Fagan, Captain W. Watson, Prof. J. Elliot, Prof. H. J. S. Smith, Messrs. W. C. Baker, W. Berridge, W. M. Burke, C. H. Holden, and C. Woollett.

MICROSCOPICAL SOCIETY.

MARCH 6TH.—H. J. Slack, Esq., President in the chair.—Messrs. J. Davis, G. Raynor, F. B. Kyngdon, and the Rev. J. E. Watts were elected Fellows.—Mr. C. Stewart described a new species of coral, said to have been obtained from an island in the vicinity of Tahiti, and which was referred to the genus Stylaster. The characteristics of the genus and the distinctive features of the new species were explained and illustrated by blackboard drawings, and specimens of the coral were exhibited under the microscope. A paper, "On a new Operculated Infusorian from New Zealand," by Mr. Hutton, was read by the President, and illustrated by drawings enlarged upon the blackboard by Mr. Stewart. A paper by Mr. A. Schulze, "On a New and Simple Means of Resolving the Finest Balsam-mounted Diatom Tests," was read by the Secretary, describing the success which had attended the examination of this class of objects by means of the reflex-illuminator, and the immersion paraboloid, moistened with castor oil in place of water. *Amphipleura pellucida* mounted in balsam was shown in this manner by Dr. Dickson in illustration of the paper. Lissajous's curves, drawn microscopically upon glass by Mr. West, were exhibited by Mr. Curtis.

PHOTOGRAPHIC SOCIETY.

FEB. 12TH.—Annual Meeting.—J. Glaisher, Esq., President, in the chair.—The silver progress medal of the Society was awarded to Capt. Abney, for the greatest advance made in the science of photography during the past year. Captain Abney exhibited a large positive photograph taken by Janssen from one of his solar photographs. Mr. E. Viles exhibited and described the heliostat and other parts of the micro-photographic apparatus used by him in making an enlargement (two hundred diameters) of the proboscis of the blow-fly.

SOCIETY OF ARTS.

FEB. 22ND.—Col. Yule in the chair.—A paper was read "On Irrigation regarded as a Preventative of Indian Famines," by Mr. W. T. Thornton.

FEB. 26TH.—Hyde Clarke, Esq., in the chair.—Adjourned discussion on Mr. Thornton's paper.

FEB. 27TH.—The Right Hon. Lord O. Fitzgerald in the chair.—Five candidates were proposed for election. A paper was read "On the Past, the Present, and the Future of the River Thames," by Mr. J. B. Redman.

FEB. 28TH.—B. F. Cobb, Esq., in the chair.—A paper "On the Chemistry of Infection, or the Germ Theory from a Chemical Point of View," was read before the Chemical Section by Mr. T. Kingzett.

MARCH 6TH.—Prof. Tyndall in the chair.—Seven candidates were proposed for election. A paper "On an Electric Lamp-Lighting System," was read by Mr. St. George L. Fox.

MARCH 13TH.—Lord Alfred S. Churchill in the chair.—Six candidates were proposed for election. The paper read was "Further Remarks on Lightning Conductors," by Dr. Mann.

ANTHROPOLOGICAL INSTITUTE.

FEB. 26TH.—Mr. J. Evans, President, in the chair. The following new Members wer announced: Mr. M. Gabriel and Mr. W Cohen. A weapon from New Zealand was exhibited by Mr. Hyde Clarke. Mr. J. Sanderson exhibited some stone implements and fragments of pottery from Natal, and read a paper on the subject of the present native inhabitants and their legends. The President remarked that the great bulk of the implements exhibited were extremely rude, and, in respect to the pottery, observed that it presented remarkable similarity in pattern to pottery found in this country, a statement confirmed by the Rev. Canon Greenwell, who remarked that the pottery was hard and well baked, and probably made for use in the household. Mr. W. St. Chad Boscawen read a paper "On the Primitive Culture of Babylonia," in which he referred to the rudely pictorial character of early Babylonian writing, and to its gradual development into a syllabic character, as shown in the syllabaries of Assur-bani-pal, which he illustrated by reference to the growth of pronominal ideas and the change of the archaic forms through hieratic into a court or script hand. Treating the earlier forms as pictorial, he suggested that they gave evidence that the original form of dwelling was a cave, which then gave place to a construction of wattle and dab, and that to a structure supported by wooden beams or columns, and having doors and windows. To these were probably attached gardens about the entrance. The honour in which women were held by their children is indicated by the ideograph for mother, which signifies "house-divinity." Mr. Boscawen then stated as his opinion that the early Babylonians used the fire-stick to kindle their fires. The ideograph for prison is "dark hole." In these early cities there were policemen who patrolled day and night. A number of other curious illustrations of the manners of ancient Babylon were deduced by Mr. Boscawen from the ideographs and syllabices, and his lecture was listened to with great interest. A discussion followed, in which Mr. Bouverie-Pusey, Prof. Boyd Dawkins, and others took part.

PHYSICAL SOCIETY.

MARCH 2ND.—Prof. G. W. Adams, President, in the chair.—The following candidates were elected Members: Mr. J. P. Kirkman and Dr. W. J. Russell. Mr. Sedley Taylor exhibited the colours produced in thin films by sonorous vibrations. Mr. W. H. Preece exhibited and described the phonograph.

SOCIETY OF ENGINEERS.

MARCH 4TH.—Mr. R. P. Spice, President, in the chair.—The following gentlemen were elected, viz.—as Members, Messrs. T. Andrews, C. G. Search, F. Brickwell, and J. Cleminson; as Associates, Mr. J. Joyce and Mr. J. S. Beeman. A paper was read by Mr. J. W. Pearse, "On Water Purification, Sanitary and Industrial."

ASTRONOMICAL SOCIETY.

MARCH 8TH.—Lord Lindsay, President in the chair.—The Rev. F. J. Hall, Lieut. R. Hoggan, Messrs. J. E. Gore, W. Hobson, W. C. Otter, and F. H. Stevens were elected Fellows. Mr. Neison read a paper "On Hansen's Term of Long Period in the Lunar Theory." He suggested that the discordances in the lunar motions previous to 1750, which are not accounted for by Hansen's theory, may possibly be accounted for by taking into consideration the action of the Sun upon the orbit of the Moon as affected by the action of Venus. Delaunay has shown that the action of Venus will cause the Moon to move in a somewhat larger orbit for a space of about fifty years, and then in a smaller orbit for a similar period. It will be evident that when the Moon is moving in the larger orbit the Earth will have less effect upon it, and consequently the perturbing action of the Sun will be greater. Mr. Neison's paper was intended to show that it is possible that the action of the Sun upon the orbit of the Moon as affected by Venus may account for the term of long period for which Delaunay was unable to find any explanation. Mr. Proctor explained a geometrical construction he has devised for determining the axial position of Mars with respect to the Earth at any epoch, by making use of the right ascension and declination of the planet as given in the *Nautical Almanack*. Mr. Ranyard read a paper by Mr. Plummer, "On the supposed Influence of a Mass of Brickwork upon the Errors of a Transit Instrument in its Neighbourhood." Upon tabulating the azimuth errors of his instrument, Mr. Plummer had found that they were positive in summer and negative during the winter months. Lord Lindsay mentioned that he had seen the transit instrument of the Edinburgh Observatory turned to the nadir. so that the reflected images of the wires were brought to coincidence with the wires themselves; upon the light of a lantern being turned upon one of the piers from a distance of some six feet, he had seen in the course of three or four minutes the wires begin to travel away from their reflected images, showing an expansion of the pier. Mr. Dunkin said that at the Royal Observatory the changes of error of the transit instrument were so uniform that one might tell from month to month what would be the error of the transit instrument to within a tenth of a second. What was the cause of these changes he did not know: it was possible that Greenwich Hill shifted periodically. Mr. Christie mentioned that Mr. Stone, at the Cape of Good Hope, had established, or believed that he had established, a connection between changes of azimuth error and the amount of water in a river near to the Observatory. Mr. Neison mentioned that the instruments in the Observatory at Armagh, which was built upon a hill, appeared to be shifted in wet weather, owing to a strata of clay at the base of the hill, which swelled when it was saturated with moisture, and slightly lifted the whole mass of the hill above it. A paper, by Mr. Stone, was read, on his new determination of the factor of parallax from a rediscussion of the observation published in the parliamentary report upon the telescopic observations of the Transit of Venus.

QUEKETT MICROSCOPICAL.

FEB. 22ND.—H. Lee, Esq., President, in the chair.—Two new Members were elected. A paper was read by Mr. West, "On Microscopic Tracings of Sang's Curves," some very beautiful specimens of which were exhibited in the room. Mr. Ingpen pointed out that many of the elliptical figures might have a great value as "test" objects, because the number of lines could be readily counted at their point of greatest divergence, but became exceedingly difficult to resolve as they approached their point of intersection. A discussion followed, in which Messrs. Curtis, Ingpen, Spencer, West, and Dr. Matthews took part, much surprise being expressed at the fact of lines so extremely delicate being ruled upon the surface of glass with a diamond point, without fracture to the surface polish or confusion of figure, even where large numbers of them intersected at very small angles.

GEOLOGICAL SOCIETY.

FEB. 15TH.—Annual Meeting.—Prof. P. M. Duncan, President, in the chair.—The President presented the Wollaston Gold Medal to Dr. T. Wright, and the balance of the proceeds of the Wollaston Donation Fund to Mr. W. J. Sollas. He next handed the Murchison Medal to Mr. W. W. Smyth for transmission to Dr. H. B. Geinitz, of Dresden; the balance of the proceeds of the Murchison Geological Fund to Mr. H. Hicks, for transmission to Mr. C. Lapworth; the Lyell Medal and part of the Lyell Fund to Mr. J. W. Hulke, for transmission to Mr. G. Busk; and the balance of the proceeds of the Lyell Fund to Dr. Oldham, for transmission to Dr. Waagen. He then read his anniversary Address. The ballot for the Council and Officers for the ensuing year was taken, and the following were elected: President, H. C. Sorby; Vice-President, R. Etheridge, J. Evans, Prof. J. Prestwich, and Prof. A. C. Ramsay; Secretaries, Prof. T. G. Bonney and Prof. J. W. Judd; Foreign Secretary, W. W. Smyth; Treasurer, J. G. Jeffreys; Council, H. Bauerman, Prof. T. G. Bonney, Prof. W. B. Dawkins, Prof. P. M. Duncan, R. Etheridge, J. Evans, H. Hicks, W. H. Hudleston, Prof. T. McKenny Hughes, J. W. Hulke, J. G. Jeffreys, Prof. T. R. Jones, Prof. J. W. Judd, J. Morris, J. A. Phillips, Prof. J. Prestwich, F. G. H. Price, Prof. A. C. Ramsay, R. H. Scott, W. W. Smyth, H. C. Sorby, Admiral T. A. B. Spratt, and the Rev. T. Wiltshire.

FEB. 20TH.—H. C. Sorby, President, in the chair.—Messrs. J. W. Carrall, E. Cleminshaw, P. J. Neate, A. Nicols, J. Snell, and J. Spencer were elected Fellows. The following communications were read:—"Notes on the Physical Geology of the Punjab," by Mr. A. B. Wynne; "Description and Correlation of the Bournemouth Beds, Part I., Upper or Marine Series," by Mr. J. S. Gardner; "Notes on Certain Modes of Occurrence of Gold in Australia," by Mr. R. Daintree; and "Notes on the Geology of the Island of Mauritius and the adjacent Islets," by Mr. W. H. T. Power.

MARCH 6TH.—H. C. Sorby, Esq., President in the chair.—Messrs. H. E. R. Bright, G. J. C. Broom, W. J. Farrer, G. Scamell, and J. F. White were elected Fellows. The following communications were read: "On the Geology of Gibraltar," by Prof. A. C. Ramsay,—and "Notes on the Geology of Japan," by Mr. J. G. H. Godfrey.

ROYAL SOCIETY OF LITERATURE.

FEB. 27TH.—C. Clark, Esq., in the chair.—Sir Patrick Colquhoun commenced reading a paper "On Historical Outlines of the Leading Religions of the World," in which he surveyed, at considerable length, the earliest forms of religion in India, which he considered to be Brahmanic, and pointed out how, from the simplicity of the earliest system, as recorded in the Vedas, the vast system of idolatry, which we know prevailed in later times, grew up, as it were, insensibly. Sir Patrick then pointed out the origin of the later practices of female infanticide, chiefly among the Rajputs, and of Suttee everywhere; and noticed the reforms in the popular religion, first by Rammohan Roy, and more recently by Keshub Sen.

ARCHÆOLOGICAL INSTITUTE.

MARCH 1ST.—Col. Pinney, V.P., in the chair.—The Rev. J. F. Russell read some "Notes on Elizabethan Communion Plate, in regard especially to the Substitution of 'Decent Cups' with 'Covers' for 'Massing' Chalices and Patens." The author treated at some length of the prohibition of the eucharistic use of the chalice and paten, "the massemongers' trinkets," by Parker and Grindall, giving many illustrations of the introduction of cups and covers in their stead. The change in the form of the new vessels was alluded to, and many interesting extracts given from works of the period and churchwardens' accounts. Mr. J. T. Micklethwaite spoke of the gradual change in the shape of the chalice between the thirteenth and sixteenth centuries, and the peculiar propriety of the chalice to its purpose, which had more to do with the substitution of the communion cup for it than any necessity for a larger vessel. Mr. C. E. Keyser read a paper "On the Mural and Decorative Paintings in Canterbury Cathedral," giving an accurate account of these valuable evidences as they formerly appeared and as they now exist, special notice being taken of the remarkable series of paintings in the chapel of St. John the Baptist. This chapel appears to have been closed up before the beginning of the eighteenth century, and presents, especially in the chancel, a surprising display of paintings, apparently executed soon after the building was erected. Mr. W. M. F. Petrie gave an account and exhibited plans of a subterranean chamber in Eltham Park, with a shaft communicating with it 142 feet deep. Many theories were adduced to account for the use of this singular work. Some objects of antiquity from the chamber were exhibited, but it having been only lately discovered, it was expected that other relics might be found which would give a clue to its purpose. Mr. Bernhard Smith exhibited an English dagger for duels, anno 14 Eliz., and a flint celt lately found in London. Capt. Hartshorne sent a fine inlaid basket-hilted sword of the time of Charles the First, and a pair of Peruvian jingle spurs were exhibited by Mr. Hartshorne. Mr. J. F. Skill exhibited a model of a font formerly existing in the church of Rotherham. Mr. R. H. Soden Smith lent two silver cups and covers, in illustration of Mr. Russell's paper.

PHILOLOGICAL SOCIETY.

MARCH 1ST.—Dr. J. A. H. Murray, V.P., in the chair.—Mr. A. J. Ellis, V.P., read a paper "On Engytype, a new Approximative System of Phonetic Writing for Philological Purposes." This was based on two principles: first, that each sign should represent a genus of sounds; and, secondly, that each species of sound should be indicated by a diacritic. The generic basis was fixed, as well as the hierarchy of the diacritics, but the use of diacritics was rendered as free as possible. Physiological action was purposely neglected, and aural distinctions alone regarded, as the system was especially intended for those who judged by ear only, and had not studied the physiological generation of sound. Provision was made for cases where the sounds did not seem to lie precisely in any genus or seem to lie between two genera. The whole alphabet was passed rapidly in review, and it was shown how the system preserved the acoustical relations to the eye, and could be immediately printed with ordinary types. Mr. Gunlogsen then read a paper "On Icelandic," with especial reference to theories of the ancient sounds.

ROYAL INSTITUTION.

MARCH 4TH.—G. Busk, Esq., Treas. and V.P., in the chair.—The Lady Louisa Mills, the Lady Belcher, Mrs. Burton Borough, Mrs. Goodall, Mrs. W. S. Kirkes, Mrs. R. C. Moore, Mrs. C. M. Norman, Miss Caroline Wheatstone, the Earl of Denbigh, Rev. A. Taylor, Dr. F. Harris, Messrs. C. Aldin, W. Aldin, J. Ashby, H. Edmunds, jun., J. Findlater, T. Gregory, A. F. Janvrin, C. J. Longman, C. Marett, W. H. Michael, T. Morson, R. Neele, W. R. Phelips, A. R. Price, and W. Weldon were elected Members.

THE INSTITUTION OF CIVIL ENGINEERS.

FEB. 26TH.—Mr. W. H. Barlow, V.P., in the chair.—The paper read was "On Liquid Fuels," by Mr. H. Aydon.

MARCH 5TH.—Mr. Bateman, President, in the chair.—The paper read was "On the Hooghly Floating Bridge," by Mr. B. Leslie. The Council had recently transferred Messrs. Frederick Cadogan Barron, Alfred Edward Garwood, Thomas Richard Guppy, Edward John Jones, Alexander Carnegie Kirk, James Livesey, James Chatburn Madeley, Robert Augustus Oldham, and Wilson Weatherley Phipson from the class of Associates to that of Members; and had admitted Messrs. Reginald Ivon Argyle, James Atkinson, Frank Brewer, Charles Friend Cooper, Henry Francis Dovey, Arthur Percy Guinness, Henry Nicholas Harvey, Herbert Henderson, Frederick Montague Townshend Lange, Charles Lee, Francis William Maclean, James Milne McNicoll, Charles Ramsden May, John North, William Purcell O'Neill, Alexander Craig Renton, Frederick Stuart Richardson, Henry William Sanford, Edward Robert Saunders, Hugh Hamilten Scott, Henry Selby Hele Shaw, John Hodgson Suart, Stephen Harding Terry, Stephen Frank Townsend, and Frederick Adlard Wright, as Students. The monthly ballot resulted in the election of Messrs. Bartholomer Parker Bidder, Neath; Bagot William Blood, Ex. Eng., P.W.D., India; David Greig, Steam Plough Works, Leeds; Harry Corbyn Levinge, B.A., Supg. Eng., P.W.D., India; John Allen McDonald, Midland Railway; Richard Henry Llewellin Roberts, Exmouth; Henry Francis Storey, Ex. Eng., P.W.D., India; Hubert Thomas, Resident Engineer to the Grand Junction Canal Company; Henry Mungo Thompson, Ex. Eng., P.W.D., Bombay; Henry Wakefield, Adam Street; and John Wilson, Dean's Yard, as Members; and of Lieut. John Copley Addison, R.E., P.W.D., India; Lieut. George Montalt Bellasis, B.S.C., Ex. Eng., P.W.D., India; Messrs. Alfred George Berry, Kingston, Jamaica; Josiah Corbett Bretland, Town Hall, Belfast; Richard Swarbrick Dugdale, Deputy Borough Engineer of Salford; Major Edward Smith Gordon, R.A., Assistant Superintendent, Royal Carriage Factory, Woolwich; Lieut. George Crispin Hammond, R.N., Saltash; Messrs. Joseph Hayward, Stud. Inst., C.E., Trowbridge; Edward Arthur Robert Innes, Stud. Inst., C.E., Port Elizabeth Harbour Works, C.G.H.; William Kilvington, Sunderland Engine Works; Charles Cornwallis Burton Knapp, Stud. Inst. C.E., Assist. Eng., P.W.D., Burmah; John Charles Larminie, Ex. Eng., P.W.D., Madras; Roberth Lathbury, Stud. Inst. CE., Scarborough; George Bolland Newton, General Manager of the North London Railway; Urban José de la Pena, Stud. Inst. C.E., Madrid; Robert William Perks, Leadenhall Street; George Romanes, Edinburgh; Lieut.-Col. Peter Henry Scratchley, R.E., Woolwich; Messrs. Samuel Spencer, Westminster; James Stuart Swallow, District Engineer, Cape Government Railways; and Hugh Henry Swan, Goods Supt. G.I.P. Railway, Bombay, as Associates.

MARCH 12TH.—Mr. Bateman, President, in the chair.—The paper read was "On Railway Appliances at the Philadelphia Exhibition of 1876," by Mr. D. Galton.

NEW SHAKSPERE.

MARCH 8TH.—Mr. Frank A. Marshall in the chair.—Mr. H. Courthope Bowen read a paper "On 'As You Like It.'"

THE NEW YORK "MINING RECORD."—With the spirit that characterises American enterprise, we perceive that the proprietor of the abover paper—which is the recognised organ of mining and monetary interests in the United States—has established a British agency in London, the offices being at 3, Catherine-street, Strand, and a City office at 53, Great Tower-street. From a cursory glance at the journal in question, it appears to fully carry out the object for which it has been established, and compares favourably with our English journals in the same interest, as it contains full accounts of mining operations in the United States, and reports of other matters appertaining to the same. Those interested in these matters would do well to become subscribers.

ACADEMIC HONOUR.—At a congregation of the Senatus Academicus of St. Andrews University, recently, the honorary degree of LL.D. was conferred on Henry Woodward, F.R.S., F.G.S., of the British Museum. The honour will be regarded as well merited by all who have had an opportunity of observing his earnest labours in the cause of science.

SADLIER'S NEW METHOD OF RAISING AND LOWERING SCREW PROPELLERS.

CAPTAIN J. W. SADLIER, of the State Line steamship State of Indiana, has (says the *Scientific American)* recently invented a new mode of raising and lowering propellers while the same are on the shaft, the object being to adjust the screw to such a depth as may, under different circumstances, be necessary to prevent its being affected by the pitching or draught of the ship. The racing of the screw during stormy weather, or when the vessel is lightly loaded, is one of the inherent evils of screw propulsion, and one to the remedying of which more atten tion might profitably be bestowed. It can readily be apprehended that the alternate lifting and immersion of the screw while in motion throw sudden strains, often of severe character, upon the engine, while racking the vessel herself; and that constant care and watchfulness are necessary to prevent injury to the machinery. Captain Sadlier's invention affords a means of placing the screw at any depth desired, and instead of having a rudder post supported only from above and located in rear of the screw, as otherwise would be necessary, he abolishes rudder posts altogether, and hinges two rudders, one on each side of the dead wood just forward of the stern-post. It may be said, however, that, according to this plan, there is really no dead-wood, as all that region abaft the bulkhead is occupied by an iron frame, through openings in the keel extension of which the water is free to enter and emerge at the after side apertures. Water pressure on both sides of the rudders is thus balanced. The rudder posts extend up to the spar deck, where they terminate in cog wheels, by means of which motion is imparted to them by simple positive steering gear. The rear portion of the screw shaft passes through a ball-and-socket water-tight joint in the bulk-head, and is attached to the main shaft by a universal joint.

There are two iron stern posts, having a deep grove on their inner sides. In this groove moves a block, and in this block are nuts for the reception of the heavy vertical screws. These screws extend up on deck, and are rotated by hand gear, so that in this way the block is caused to travel up and down. The block receives a long bush-bearing block, which is pivoted therein, and through which the screw shaft passes.

When twin screws are fitted on this system, the ordinary arrangement of central rudder would be employed, and two double-cased vertical radial chambers could be fitted, one under each quarter, for the shafts of the porte and starboard screws. The propellers would be in advance of the centre stern post, so that the rudder could be put hard a-port or a-starboard without interfering with the action of either screw. In this case either both of the propellers, separately or simultaneously, would be raised or lowered by similar gearing, as in the case of the single screw.

One advantage which Captain Sadlier anticipates from this invention is that it will admit of much more beam and much less draught of water than in the case of vessels constructed on the ordinary stationary propeller and single rudder plan. He also considers that steamers built with these improvements will possess greater strength, and be safer and better sea boats by reason of these superior properties; and that the carrying capacity will be increased without a corresponding increase in the cost of construction. In case of an accident to the machinery at sea, rendering steam as a motive power impracticable, the propeller could be raised out of the water, and the vessel could proceed much more expeditiously under sail.

With these improvements it is also pointed out that all necessary repairs connected with the propeller could be made either at sea or in port, without sending the vessel into dock; that the damage which not infrequently results from hawsers fouling the propeller shaft in port or elsewhere would be avoided; and that steamers could be constructed so as to admit of their being shifted without ballast.

A CURIOUS PHENOMENON.

THE Westinghouse Automatic Brake Company exhibit at their office in St. Stephen's Palace-chambers, Westminster, a working apparatus which displays the action of a brake upon a train. The apparatus consists of the platform of a single carriage, with the brake levers fitted to the wheels; and upon the platform are the brake cylinders of the other carriages of a long train placed side by side, but yet separated by the same lengths of tubing which would intervene between them in a train. The whole action of the brake, the means of putting it on and off, and of graduating its force, may thus be conveniently studied, and the instantaneous character of its working is beautifully shown. Appended to the brake gear is a nozzle, arranged for the exhibition of a curious phenomenon which was first observed at Philadelphia. By turning a tap, a jet of air, released from great compression, issues from the nozzle; and this jet will support two or three balls, as balls are often supported by a fountain. The peculiarity of the effect, however, is that the jet need not be vertical, but that it will support the balls when the course of the air is at an angle of 45 deg. with the horizon. If the force of the jet, in these circumstances, is diminished, the balls do not fall vertically, but backwards along the oblique line of the stream of air, so as to come near the nozzle. The balls may be of any material, as glass, wood, or india-rubber; but a hollow india-rubber ball, which is of equal thickness throughout, displays some curious phenomena of rotation. When placed in the jet, it soon begins to spin; and as the speed of its rotation increases its shape gradually changes, and it becomes first an oblate spheroid and ultimately an almost flattened disc. As it flattens its axis of rotation gradually turns round; and when this axis comes to be at right angles to its original position, the speed of the rotation diminishes, and the ball ultimately comes to rest. For a moment it remains motionless, supported by the jet, and then it begins to spin again upon an axis, and repeats the former changes of position and of speed *ad infinitum.* At the International Exhibition at Philadelphia these rotating balls attracted great attention, and some of the most eminent mathematicians in the United States were occupied in formulating the laws which governed their movements.—*Times.*

THE TELEPHONE.

"H. P." recently addressed the following letter to the *Times* :—

"Sir,—Perhaps it will interest many of your readers who take an interest in the telephone to learn that Professor Graham Bell's is not a new invention, but merely an improvement, as will be seen from the following :—

"As far back as 1860 a Mr. Philipp Reis read a paper at a meeting of the Physical Society, at Frankfort-on-the-Main, which was printed in the annual Proceedings of that society, describing an instrument which he constructed in order to explain the functions of the ear, but which also serves, he said, to transmit all kinds of sounds by means of a galvanic current to any distance, and he called this instrument a 'Telephone.' The inventor of this telephone was born on on the 7th of January, 1834, at Giessen, and died on the 14th of January, 1874.

"The telephone, therefore, is certainly not a new invention."

RECENT AMERICAN AND FOREIGN PATENTS.

The improvements in a new box iron devised by M. Jean G. Ruger, of Paris, France, consist in providing one end of the iron with a partition plate, so arranged as to form an air inlet passage; and, second, in a movable chimney for the escape of the gaseous products of combustion, the chimney being adjustable to discharge the gases in the direction least liable to interfere with the operator or to injure the material.

Mr. Lars P. Bergstrom, of Rock Island, Ill., has invented an improved winding alarm for clocks. It is attached to eight-day and thirty-day clocks, run by weights, to cause them to give an alarm when they are about to run down.

Mr. Wm. T. Urie, of Warrensburgh, Johnson Co., Mo., has devised a new spark arrester. In the smoke stack is arranged a curved, downwardly projecting, annular flange, which deflects the sparks downwardly and to the centre. Below this is arranged a centrally located two-part hopper, which, in combination with the deflecting flange, causes the sparks to be first diverted outwardly, then deflected downwardly and centrally against the inner walls of the upper furnace, whence they fall into the lower closed funnel, and are drawn (by a current induced by the force of the next blast) up between the inner walls of the lower furnace and the outer walls of the upper funnel into the main current, in which they circulate.

An improvement in that class of curtain fixtures in which the rolling curtains are adapted for lowering from the top has been devised by Mr. William W. Pickford, of East Palestine, Ohio. In this improved curtain fixture the holders and clamps for the curtain cords are arranged in a novel and ingenious manner.

A tail piece for guitars has been invented by Mr. Jacob Abraham, of Silver City, New Mexico, which is made of metal or other suitable material, and is combined with a flanged foot rest, the object being to effect the vibration and at the same time prevent cutting or scratching the box of the guitar.

Mr. D. P. Ferguson, of Janesborough, Ga., has devised a light plough, suitable for furrowing, cultivating, &c., in which the standard is pivoted near its middle to an inclined brace, whose upper end is pivoted to the rear end of the beam. The standard may be adjusted at various inclinations to vary the depth at which the shovel or plough proper shall enter the soil, and is clamped and held in any adjustment by friction with a slotted wedge which is placed on the upper side of the beam and under a cross bar or rod passing through the forked end of the standard.

Mr. A. H. Ballagh, of Macon City, Mo., has patented an improved harrow, which may be readily adjusted to hold the teeth in any desired position from vertical to horizontal when at work, the machine in the latter case being used as a clod crusher, thus combining two implements in one.

An improved tunnelling and excavating machine has recently been patented, which is constructed with a cylindrical case or shield having a concave socket to which the convex portion of an interior case is fitted. The latter carries the excavating mechanism. Within it there are two concentric drums, the outer one of which rotates in contact with longitudinal rollers carried by the case, and the inner one rotates with the outer one and is capable of sliding longitudinally in it, being guided and supported by friction rollers. To the rear end of this drum a chain wheel is secured for receiving the driving chain, and to its front end a series of cutters are attached. A shaft carrying an earth auger is journalled in the centre of the inner drum, and there are suitable devices for operating and adjusting the various parts. This machine is the invention of Mr. Hawley N. Cargill, of Grand Rapids, Mich.

An improved churn is the invention of Messrs. John A. McConnell and Wm. V. McConnell, of Houston, Texas. By suitable gearing the motion from a crank operates a vertical dasher shaft having a head on the lower end secured in a box, and the whole so arranged that the cover and its attachments may be removed without disconnecting the dasher shaft.

Mr. Chester L. Crowell, of Rockdale, N.Y., has devised an ingenious form of weighing scale, in which the scale pan is always kept accurately in balance, and any weight placed upon it conveniently read off.

Type cases have remained much the same since the days of old Ben. Franklin, but now comes Mr. Julius Ropes, of Ishpeming, Mich., with a decided innovation, consisting mainly in making the case a circular shape and adding two pivoted covers which keep out the dust. This case is also adapted to holding other articles than type.

Mr. Theodore G. Ames, of Denton, Texas, has patented an apparatus for preserving meat, &c. It is used for fumigating substances used as food, and also for impregnating water with sulphurous acid gas, for the purpose of preserving such substances by the antiseptic quality of sulphur.

Mr. Chas. H. Bear, of Manchester, York Co., Pa., has patented a hitching device. It is designed to hold the animal at a sufficient distance from the object to which he is hitched to prevent him from rubbing or biting the same. It consists of a stiff and strong standard having at its outer or upper end a loosely connected snap hook, and provided at its lower end with three divergent feet, or tripod support, braced and held by a circular metallic ring, and provided with a strap at the junction of its three feet which is adapted to secure the device to any immovable object, the arrangement being such as to permit the device to be attached to a ring in the pavement, a post, tree, fence, or the wheel of the vehicle.

A lubricator, patented by Messrs. A. M. Higgins and Newton Devereux, of Manton, R.I., consists of a chamber formed at the ends of the engine slide, for receiving cotton waste or other fibrous material, and in an oil receptacle having a perforated bottom and fitted to the chamber in the slide, for supplying oil to the cotton waste. The slide is thus kept constantly lubricated and free from dirt.

Mr. Claus Raabe, of Clifton, N.Y., has invented a new and improved self-adjusting head section for couches, which forms a convenient and comfortable support for the head of a person lying upon the couch.

An improvement in brushes, for whitewash, varnish, paint, paste, and other purposes, has been patented by Messrs. Wm. B. Burtnett and George W. Cook, of New York city. In this new form of brush the bristles are confined by a metal band in such manner that they are held more firmly in place, the nails cannot be drawn from the band by swelling, and the side parts of the band act as a spring to render the brush more elastic.

A cheap and simple fire escape has been invented by Messrs. George Lee Whaley, of Bachelor, Mo., and John K. Hassler, of Shamrock, Mo., which is claimed to be durable, always ready, and not in the way.

A remarkably strong wooden basket, which, is said to be cheaper than equivalent ones made of willow, is the invention of Mr. Jacob W. Sickler, of Tompkinsville, Pa. The novelty consists in the peculiar shape of the wood sections, connected at the upper edge by inner and outer hoops or rims, at the middle part by one or more bindings of wire, and at the bottom by a recessed stiffening disk, to which the sections are nailed.

Mr. Edward K. Burke, of New York city, has invented a box for books, the object of which is to furnish a receptacle for costly, rare, and beautiful books, and which is so constructed that their covers, sides, and ends may be turned down into a horizontal position to enable a book to be used without being removed from the box.

A simple and inexpensive shutter fastener has been invented by Mr. Daniel Ward, of New York city, which operates by a coiled spring contained in a cylinder, and acting upon the edge of the pivoted latch.

Mr. Thomas Donohue, of New York city, has invented an improved coat hanger, by which the shape of garments is not impaired, a chain of short links being attached by split rings to metallic eyes fastened at suitable distance to the inner side of the collar or band.

An improved form of stop-cock has been invented by Messrs. Samuel M. Denniston and Charles Simmons, of Prescott, Arizona. The invention consists in a tapering tube having at its larger end a hexagonal portion for receiving a wrench, and also a flange and a threaded portion for receiving a faucet. It is adapted to both barrels and cans, and is a useful little affair.

A cheap and effective compound vehicle spring has been invented by Mr. Eugene T. Westerfield, of New York city, the elasticity of which under light or heavy burdens is equalised, and which is not liable to break by a sudden jolt or jar.

Mr. Albert L. Lincoln, of Bethel, Vt., has invented a new and improved expansible horseshoe, which is designed to restore contracted horse feet to a normal condition. This is accomplished by combining with a stationary toe piece and pivoted side pieces an adjustable frog pad and spurred connecting links or braces, for expanding and contracting the shoe and with it the hoof.

Lewis W. Drake, of Hazleton, Pa., has invented an improved coffin, which has a peculiar construction of corner pieces, the object being to give a more ornamental form and finish, together with a stronger joint of the corners with the sides and ends. The corner piece has external end beads with rectangular end grooves, the latter being between angular tongues, the whole fitting in with the end and side pieces in a secure manner.

Messrs. Marcus M. Manville and Charles A. Bissett, of Whiteball, N.Y., have invented a new form of hose coupling which promises well, as by its use the hose may be coupled on the ground without being raised and without interrupting the flow of water.

An improved folding table has been invented by Mr. George A. Trimble, of Crown Point, N.Y., which is so constructed as to enable the loose motion of the joints to be taken up, so that it will be held firmly and securely, and at the same time is simple in construction and convenient in use. The cross bar between the legs work on wrought iron bars of quadrant shape, and by tightening thumbscrews the position of the legs is fixed. The legs and cross bars are so arranged that when folded the former overlap each other, thus making the table compact.

An improved hot blast oven has been invented by Mr. Jesse Smith, of Newark, Ohio. This oven is heated by gas, which may be obtained from the waste gases of the blast furnace or from the distillation of coal, wood, or oil, and is designed for heating air or gas for the purpose of supplying blast furnaces, Bessemer converters, heating, and other furnaces. It is circular in form, with a dome-shaped top. The gas is let into a combustion chamber at the bottom by suitable valves, and the flame and products of combustion pass out through a series of horizontal flues arranged one above the other and connected at alternate ends. In passing through this zigzag course, a large heating surface is exposed, and the oven soon heated. Then the gas is turned off and the cold air which is to be heated is passed through the same flues. It is proposed to use these ovens in groups of two or more, so that while air is being heated in one group the others are being brought up to the required temperature by burning gas in them.

MR. SEDLY TAYLOR communicates to the Physical Society a process for making sound waves visible to the eye. A hole cut in a piece of card-board is filled with a film of soap in glycerine, just thick enough to produce bands of colour. This card is fastened to a tuning-fork, which is thrown into vibration by a violin bow, when the coloured film is immediately thrown into vibration, and vortex rings and square bands of colour are produced on the screen.

PREVENTION OF HYDROPHOBIA.—Immediately a person is bitten, open the wound with a lancet or other sharp instrument; wash with hot water, then well brush and bathe the place with a very strong solution of bichromate of potash: do not cover the wound, but let it be exposed to the air as much as possible. In a few days the place will commence to ulcerate into (in all probability a round sore, which will cake over with a scab; this will in time come out, and the place will close with new flesh. Keep the bowels well regulated. I have found this treatment most effectual for the bites of dogs, and for staying the course of ulcers, &c., on the human body.—J. H. Swindells, *Chemical News*.

A NEW composite metal, called *Goloid*, has been lately patented, and seems to present several valuable properties, which were recently explained by the inventor to the House Committee on Coinage, Weights, and Measures. The composition represents 40 per cent. as compared with the gold and 60 per cent. as compared with silver. When combined with alloy, the mixture representing the value of the silver dollar would be but half the bulk. He said it had one peculiarity. Its density is greater than the average density of its components. It is at a premium of three per cent. in England to-day, for the reason that its chemical affinity for gold makes it a valuable agent in mining, and separates particles of gold which would otherwise be lost. One advantage which it possesses is its hardness, in which it exceeds gold.—*Western Review of Science and Industry* (*U.S.*)

ORIGIN OF PETROLEUM.—M. H. Byasson has been led by the following experiment to give a scientific explanation of the formation of petroleum: If a mixture of vapour of water, carbonic acid, and sulphuretted hydrogen be made to act upon iron heated to a white heat in an iron tube, a certain quantity of liquid carburets will be formed. This mixture of carburets is comparable to petroleum. The formation of petroleum can thus be naturally explained by the action of chemical forces. The water of the sea, penetrating into the cavity of the terrestrial crust, carries with it numerous materials, and especially marine limestones. If the subterranean cavity permits these new products to penetrate to a depth where the temperature is sufficiently high, in contact with metallic substances, such as iron or its sulphurets, we have a formation of carburets. These bodies will form part of the gases whose expansive force causes earthquakes, volcanic eruptions, &c. Petroleum is always found in the neighbourhood of volcanic regions or along mountain chains. In general it will be modified in its properties by causes acting after its formation, such as partial distillation, &c. Petroleum deposits will always be accompanied by salt water or rock salt. Often and especially where the deposit is among hard and compact rocks, it will be accompanied by gas, such as hydrogen, sulphuretted hydrogen, carbonic acid, &c. — *Revue Industrielle*.

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